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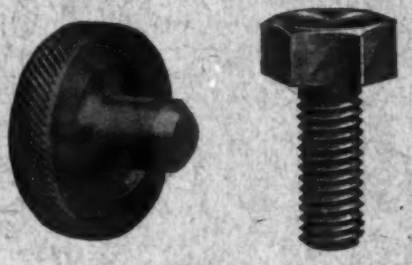

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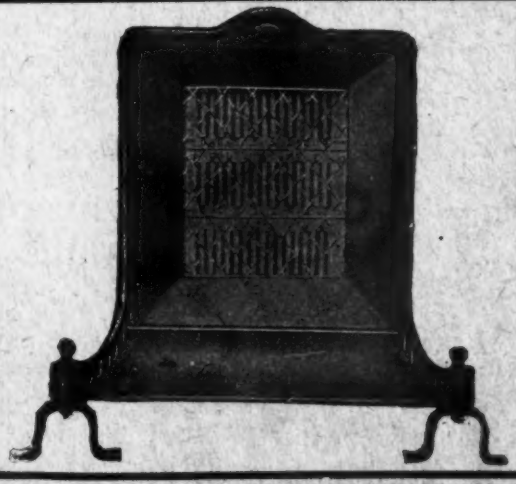

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INDUSTRIAL CONDITIONS IN GERMANY IN 1919.

IT is not with any degree of satisfaction that we lay down the report which was issued in the last week of June by the Department of Overseas Trade (Development and Intelligence) "on industrial and commercial conditions in Germany at the close of the year 1919." The report is decidedly "poor stuff" from an industrial and commercial point of view; it is no credit to the Department concerned, and it is doubtful whether the industrial parts are worth the money devoted to their preparation. Some eight pages are occupied by finance and taxation, five pages by coal and railways, three by iron and steel, two by leather, three by shipping, and two by aviation, while the remaining eleven pages deal with statistics. Apart from finance and taxation, and most of the statistics, practically all the information has already previously been published in English journals and newspapers, and the report is more remarkable for what it omits than for what it contains.

The whole tenor of the section on coal and railways is the great shortage of coal for industrial and domestic purposes, and for the working of the railways and the gas and electricity supply works, the latter of which had to curtail their supply to consumers, and some even had to shut down. It is also mentioned that a number of blast furnaces and steel plants in the Siegerland were brought to a standstill, but the situation of the great iron and steel works in Westphalia, which own most of the mines and works in the Siegerland, is not even considered worthy of notice from the point of view of the scarcity of coal and coke. In the appendix on coal it is stated that the production of coal in the Ruhr in December averaged 268,500 tons per day, or 6,471,000 tons for the month, and the price of Ruhr coal, which was only 11 marks per ton at the pit in January, 1913, had risen to 105 marks in January, 1920. It is, however, more to the point for the public to be informed that, thanks to the employment of a larger number of miners and the working at many pits of two extra half shifts per week, the output of pit coal in the Ruhr reached 7,092,000 tons in May, 1920, as compared with 6,511,000 tons in April, and the daily production on these special days now exceeds 300,000 tons. It is also necessary to mention that such enormous advances have been made in the Ruhr this year that at the present moment the prices of coal range from 194 to 262 marks per ton, on rail at the pits, while the wages now paid to underground and surface workers average 45 marks per shift, as compared with about one-seventh of this amount in former periods of peace.

The transport services by rail naturally suffered from the scarcity of coal, but this difficulty has now been overcome. The report, however, does not give any information concerning the amalgamation of all the Federal State railways into one uniform network, which was under consideration last year, and which has since been carried into effect. But it does refer to the number of railway trucks and locomotives needing repair, and states that the Government has closed some of the most important shops, "because it was felt that nothing short of this step would have any effect on the stubbornness of the workmen"; that is, their idleness and indifference, according to the report. A more important question, however, was also at stake—the problem of piece work. If it is possible for the report to cite the closing of the shops in January, 1920, the authors should also have been able to announce that the 13 State shops concerned were re-opened a few weeks later on the men agreeing to work on the piece system, and they began to turn out more

locomotives in a repaired condition weekly than were sent into the shops for repairs every week. It is necessary to state this fact, because innocent readers might infer from the report that the shops are still closed, and no improvement in repair work has taken place.

If we now turn to the iron and steel section, we find the statement that it may be imagined from the remarks concerning coal that the iron and steel industry also had great difficulties to contend with last year. After quoting from the annual report of a leading company, and from observations made by chairmen at the annual meetings of two important companies, the report enumerates the transfer to foreign ownership of certain German iron-ore mines and iron and steel works in Luxemburg, on the left bank of the Rhine, and in former German Lorraine. As details of all these matters have already been published in English journals, no occasion arises for reproducing them in this place; and they represent the substance of the three pages devoted to iron and steel! The reader looks in vain for any guidance as to the situation of the great steelworks in Westphalia at the end of 1919; and he is given no information concerning the Steel Syndicate's activity in the home and export trade in 1918-19 and the death-struggles of the Steel Syndicate with the Government in the final quarter of 1919 (continued early in 1920) in its attempt to defeat the Ministry for Economy's scheme to replace the syndicate by a so-called self-governing organisation composed of representatives of producers, merchants, consumers, and workmen. Nor is the reader informed of the production of iron and steel in Germany in 1919. It is true that the figures for November and December were purposely withheld by the Association of Iron and Steel Producers, and have been withheld ever since, but the output of pig-iron in the 10 months ended with October was 5,281,000 tons, and approximately 6,280,000 tons for the complete year; while the production of steel was approximately 8,000,000 tons in 1919.

We pass over the questions of leather, shipping and aviation, and then reach—not the chemical, electrical, shipbuilding and engineering industries—but the "conclusion." In this connection the report states that "a picture has been drawn which can leave no doubt as to the state of the country. Except for the idiosyncrasies peculiar to each, the general condition of the great German industries presents very much the same features as described in connection with iron and steel." But what are these features? Extracts from a company report and speeches of two company chairmen! As for the chemical industry, the report remarks that all the large concerns lie in occupied territory, and as they have been under Allied supervision, hardly fall within the scope of this report; but as far as can be ascertained, they also have suffered from the shortage of coal and of many other essential raw materials. Quite so. But surely it was not beyond the province of the report to have referred to the great aniline dye trust, though mostly in occupied territory, and its augmentation of share and preference capital last November by hundreds of millions of marks, so as to prevent the introduction of foreign influence of a dominating character, and to strengthen the bonds uniting the several companies forming the trust. This *was* in 1919. We cannot understand this omission, but we can comprehend, because applying to May of this year, that no information is given concerning the enormous profits made by the dye companies in 1919 through the disposal of stocks abroad, at the world's market prices, and despite the obligation imposed by the Treaty of Peace to deliver 50 per cent. of the stocks to the Allies.

The report is even more reticent regarding the electrical industry; there is nothing about the course of business, prices, capital increases, labour conditions, &c. So insignificant is the German electrical industry considered to be, that it is dismissed with less than a line. "The electrotechnical industry," the report states, "and the many branches of machine construction are practically in the same state"—that is, they have suffered from a shortage of coal, and of many other essential raw materials. It is impossible to leave the report without an expression of great disappointment at the superficiality of most of the information on the one hand, and the complete silence regarding important matters on the other. Yet these obvious defects could have been lessened somewhat by the placing at the end of the report of one single page summarising the general situation in Germany at the beginning of June, and thus bringing the report up to date. It is very much to be feared that the Overseas Department, like so many other Government departments, does not yet possess a properly qualified staff for dealing with questions—at all events with regard to industries in Germany—in such a manner as to depict the situation in a form conducive to the enlightenment of the public. A report like the present one would never have been signed by a Trade Commissioner; it would not have borne the signature of a commercial attaché or counsellor unless he were perfectly innocent of commercial and industrial matters, and no man who possessed a reputation he desired to maintain would have placed his name at the foot of this uninforming, uninteresting, and almost useless report regarded from a commercial and industrial point of view.

National Awards. The subject of Whitley Councils in the electrical industries and their awards has lately assumed prominence owing to regrettable hitches in their working, due partly to the actions of the Councils and partly to those of the constituent supply authorities, and it came under discussion at the recent I.M.E.A. Convention. We have already dealt with the cases of Gillingham and Wimbledon, where awards of the Home Counties Joint Industrial Council and the National Joint Board of Employers and Staff Members were repudiated by the municipalities concerned (in the latter case, we believe, through a misunderstanding which was quickly rectified). We now have to record the case of Worcester City Council, which, on the recommendation of the Electricity Committee, refused to accept an award, and substituted other advances in salary for those due under the award. The explanation was that while an award of the National Board was based on plant capacity, it happened that the maximum load on the plant was at the time less than half that value. Whether this is or is not a legitimate plea we shall not pause to discuss. Again, complaints were made at the Convention that certain corporations, with Bradford cited as the worst offender, had not confined their action to complying with the award of the Tramway Industrial Council, but had greatly overshot the mark by giving higher increases of wages, and had thus upset the position throughout the whole country.

All the foregoing are examples of local authorities refusing to comply with the awards. But at the Convention a case was cited in respect of the London Whitley Council, on which sat two representatives of London companies; these assented to an award, but on its publication the companies concerned declined to accept it, resigned from the Council, and withdrew their representatives.

The above are only typical examples; many others, we regret to say, could readily be cited.

A totally different case involves the relations between the National Council and the District Councils (Electricity Supply). The latter had agreed an award—of course, with the full approval of the Trade Union representatives—and all was proceeding satisfactorily when the National Council threw a bomb in the shape of a decision to refer the question to arbitration, without consulting the District Councils. We published last week an emphatic protest from the District Council for No. 9 area, the Employers' Side of which flatly refused to take part in the arbitration, or to be bound by its decision.

Now, what does all this represent but a state of instability, discord, and indiscretion, which is not far removed from chaos? And who are the responsible parties in all the cases we have mentioned? *In every instance the employers are the recalcitrants, although they are fully represented on the respective Councils and the National Board.* Is not this a truly deplorable display of disloyalty and insubordination? and is it not a disgraceful example to place before the Trade Unions, which have loyally accepted the awards to which their representatives have subscribed? There appears to be nothing to choose between

companies and municipalities in this respect. The native sense of individuality retains its vigour even in the bosom of a municipal council—indeed, it was that sense which, under the disguise of democratic principles, led to the early Electric Lighting Acts, enabling each local authority to possess its own little undertaking, and thus produced that unfortunate state of affairs which the 1919 Act was designed to revolutionise. But the principles of democracy require submission of the section, as well as of the individual, to the will of the majority for the public welfare, and this should be laid to heart by the committees and companies which at present control the public supply of electricity. We warn them that the path that some of them are treading leads either to a humiliating surrender in the near future, or to what is much more serious, and may be disastrous—the breakdown of the Whitley Council system.

That the Whitley Councils have already effected a very marked and real amelioration of the relations between the employers and employed who sit on them, is a fact which cannot be denied. A strong appeal was made at the I.M.E.A. Convention to the municipal authorities to comply loyally with the awards of both the Councils and the National Board, and we would extend that appeal also to the companies concerned. The day of watertight compartments is past; those who uphold it are the Sinn Fein of electricity supply.

"We Must Export to Live!"

Mr. Kellaway, the Minister in Charge of the Department of Overseas Trade, has been speaking with justifiable emphasis on the imperative necessity for us as a people to work with the greatest possible enthusiasm to secure a rapid and continuous increase in the export trade. It is true that our export trade values are making an improving showing in the monthly returns, but there is a fine opportunity for sending the volume of foreign trade up far beyond any hitherto recorded figures. It is reported from all directions abroad that our products are urgently required, and the warning is given that if we are not able to meet the demand promptly, our international competitors will secure the business. Mr. Kellaway follows his predecessors in office with a clarion call to the industrial and trading sections of the community. "*Without a great export trade we can neither feed nor clothe our people. We must export to live.*" One solitary speech, however compelling in its influence upon a small audience of commercial men, can do little compared to a campaign which shall get this commonplace truth home to the minds of the million. Such words ought to be prominently displayed upon every conspicuous hoarding in the industrial centres. The words "increase production!" have lost their appeal, but we will not believe that leaders lack the imagination necessary to bring up before the workers what on a previous occasion we ventured to describe as "The Export Vision." We must needs work out our own salvation, and must try all the harder now that the 60 per cent. E.P.D. has to remain.

The Imperial Wireless Chain.

In our last issue we gave an abstract of the report of the Imperial Wireless Telegraphy Committee, of which Sir Henry Norman was chairman, showing that the Committee, which was technically very strong, recommended the establishment of an Imperial chain of stations about 2,000 miles apart, relying upon the use of thermionic valves for transmission and, of course, for reception. The adoption of the valve would be a somewhat bold step, seeing that no commercial service over such distances has yet been put in operation by this means, but it cannot be denied that development is rapidly proceeding in that direction. The practical alternative is the Poulsen arc system, which is actually in extended use for long-distance working—even exceeding a range of 5,000 miles, as we have shown*—and this also has great possibilities before it. In this connection we would refer to the fact that the fundamental Poulsen patents have all expired, and the statement of Mr. Godfrey Isaacs, reported in our issue of July 2nd, that "all the evidence went to show that the Poulsen arcs belonged to the Marconi Co.," is therefore misleading; the Poulsen arc is subject to no monopoly.

That such a wireless chain is necessary and feasible is beyond dispute; but for the pernicious effects of political wire-pulling—or should we say wireless-pulling?—we should probably have had it in operation before the war broke out.

Further, it ought to be owned by the States of the Empire. But whether it ought to be operated by the State or by a controlled company is a very different question. We have seen so much of the effects of State operation, especially during the War, that we have the gravest misgivings as to the desirability of placing the wireless chain in the hands of Government departments. On the other hand, there is one bright, if solitary, example of efficiency to the credit of the State—the management of the Pacific Cable by a Commission. In this connection we can hardly ignore the ambitious scheme put forward by the Marconi Co. (see Electrical Review, March 19th, 1920), which was curtly turned down by the committee; without discussing the merits of the rival schemes, we must express the opinion that the decision of the Marconi Co., owing to a personal quarrel between its managing director and the chairman of the committee, to abstain from giving evidence before the committee was a strategical blunder of the first magnitude. In the past we have defended the company against unjust political and other attacks, but in this case we must admit that if it is cut out of the Imperial scheme, it will only have itself to thank.

* Electrical Review, April 2nd, 1920, p. 424.

Financial Responsibility for Electricity Supply.

The scheme for a "West of England Joint Electricity Authority" is now apparently going forward for the judgment of the Electricity Commissioners. The feature which excites, perhaps, the most general interest is the provision made to meet possible losses. This has always been one of the questions which arise in every schmee for co-ordinating electricity supply. "Who pays if the expenses can't be met?" Hope springs eternal in the breast of the promoters, of course, but the unemotional demand of finance is that security of some kind must be forthcoming—in case things go wrong temporarily. The West of England has solved the problem by proposing that the authority, in the case of both ends not meeting, or of its anticipating such eventuality, shall have power to issue precepts on the member undertakings, County Councils, and others represented, for the deficit—proportionately to their voting representation on the electricity authority.

The provision is criticised, of course, such criticism harping mostly on the refrain: "We don't know what we are in for." This is true, of course; but, on the other hand, it is easy to magnify the possibilities, even the most remote possibilities, into alarming dimensions. The problem for such critics is—what do they propose as an alternative? An electricity authority must get funds from somewhere. It cannot borrow money without security. Someone must guarantee, and the West of England Authority considers that the several members composing the body are the rightful guarantors. The matter will be one of the first to be considered by the Commissioners, and it will be interesting to hear the alternative proposals that presumably will be put forward. Here is a chance for financial "experts" to be really useful. In the West of England scheme the bulk of the interests are municipal. The company undertakings, although there are a good number, are mostly small, and consequently their financial responsibilities in respect of any deficit are comparatively light; in fact, from the point of view of most of the companies, the scheme is probably regarded with favour. The future is none too rosy for small undertakings, and abounds in "risks," so the whole question turns on whether the risks under a joint electricity authority are greater than the risks in isolation. The sporting chance seems, in this case, decidedly in favour of the joint electricity authority. The municipalities have eagerly backed the national scheme; as was pointed out at the I.M.E.A. Convention, they must be prepared to find the money if they obtain control; and they must face the risks also. They cannot have it both ways.

But, as a matter of fact, the risks are more imaginary than real.

A NEW WIRELESS CALL SIGNAL.

By E. H. SHAUGHNESSY, O.B.E., M.I.E.E.

One of the drawbacks of ordinary wireless reception has been that it was until recently impossible to make the received signals ring a bell, to call the operator to his post when he was wanted. This was due to the received signals being too weak to actuate reliably any ordinary telegraph relay. This defect necessitated an operator being at the receiving set continuously, if signals were expected at any hour of the day.

The development of thermionic valves in the last few years has enabled the weak wireless signals to be amplified or magnified sufficiently to work a relay which will ring a bell.

At some of the outlying small wireless stations in this country working to lightships or islands, the traffic is so small that it does not justify continuous attention by operators, and the Post Office has, therefore, developed the calling device described below to overcome this difficulty. The calling device could also be applied to the distress signal at sea, commonly known as the S.O.S. signal. On some of the smaller ships the saving in operators' wages by this provision would be a very important one. The utility of wireless for saving life at sea has been very fully recognised for some time past, and a system which will reduce its working costs is bound to be of considerable benefit, and may lead to its wider application to ships which are not at present compelled to carry wireless.

Several other systems of calling by ringing a bell have been evolved recently, but they usually present some drawback, such as liability to jamming, or interference by atmospherics, or are complex and delicate in their mechanism.

The conditions which govern the design of a calling device may be briefly stated as follows :—

1. The signal which is to actuate the calling device at the receiving end should be such that it can be sent by hand without difficulty, and with no more accurate timing device than a watch or clock with a seconds hand.

2. The calling device should respond to the calling signal even through strong jamming or atmospheric interference.

3. The calling device should refuse to respond to very strong signalling or atmospherics which are unaccompanied by the calling signal.

4. The complete receiving apparatus with the calling device should not be less sensitive than a good crystal detector on the same aerial.

5. It should give an audible warning if from any cause, such as a filament breaking, it ceases to be responsive.

6. It should ring a bell, in order to attract the attention of the operator.

The type of signal which is most free from the effects of atmospherics or jamming is a long dash, as the effects of either form of interference assist the signal. Calling signals

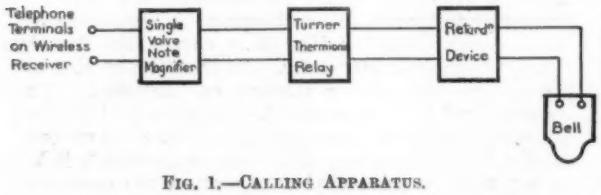


Fig. 1.—Calling Apparatus.

which have spacing intervals as part of their make-up are liable to be interfered with by atmospherics or jamming occurring in those intervals.

The long dash has, therefore, been adopted as the signal in the wireless calling device described below. The apparatus has been designed to ring the bell at the conclusion of a signal of 15 seconds' duration, but any longer or shorter interval can be provided for.

The arrangement is intended to take the place of the operator's telephone receiver when he is absent, and consists of the chain of apparatus shown in fig. 1.

The thermionic trigger relay employed is that described by Capt. L. B. Turner before the Institution of Electrical Engineers, June 30th, 1919, but any other suitable wireless relay can be used in lieu.

The retardation device may consist of either an oil, air, or other dashpot or delay-action relay designed to ring the bell at the conclusion of a predetermined interval, but the arrangement preferred is one based upon the principle of the long interval of time necessary to charge up a condenser through a high resistance. See fig. 2.

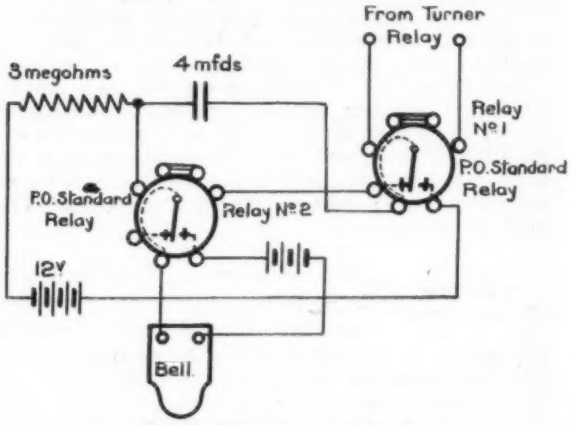


Fig. 2.—Retardation Device.

Relay No. 1 of the retardation device is operated by the Turner trigger relay. When the tongue moves over to the marking stop the condenser is charged slowly through the high resistance of 3 megohms, and if it remains on this stop for about 12 seconds (with the particular adjustments employed in this case), the condenser accumulates sufficient charge, so that when the signal ceases, and the tongue of relay No. 1 moves back to the spacing stop, the discharge can deflect relay No. 2, which rings the bell. If the tongue of relay No. 1 does not remain on the marking stop for a sufficiently long interval, the condenser will not have sufficient charge to affect relay No. 2.

The latter relay is adjusted to neutral bias with a wide gap between the contacts. In this position it is very stable, and not liable to alteration of its adjustment.

It is possible to dispense with the two relays and work a suitably designed continuously-ringing bell directly off the contacts of the Turner relay, with the same retardation arrangement of condenser and high resistance, thus reducing the quantity of apparatus, but the original apparatus set up has been described, as it illustrates the principle more clearly.

Both the systems of dashpot and condenser-high resistance retardation have been employed in the Post Office for a number of years for calling the attention of operators at land line and cable relay stations where the operator is not listening on the set continuously, and have proved very reliable and invaluable in practice. In their application to wireless calling, the condenser-high resistance method was found to be a slight improvement on the dashpot methods tried, and it has accordingly been adopted. Trials of the set have shown that no amount of jamming or atmospheric interference will give a false call, or, on the other hand, prevent the bell ringing when the long dash signal is sent out by a distant station. The calling device has also been fitted on the Post Office cable ship *Monarch*, and has proved quite successful through heavy jamming up to ranges of over 100 miles. It has also been found possible to work the call device on an aerial tuned to 300 metres, when at the same time another aerial, a few yards away, was transmitting on 600 metres. The current induced in the 300-metre aerial from the adjacent aerial was half an ampere, and in these circumstances the trigger relay recorded

the 600-metre signals, but did not ring the bell. On the arrival of the long dash on the 300-metre wave-length, the bell rang satisfactorily. This is almost the most severe test of jamming which could be devised.

It is possible that a false call may be received if another operator in the vicinity is "tuning up" by depressing his key for a long interval of time. This can be overcome either by insisting on operators who are tuning up not keeping their keys depressed for longer intervals than, say, five seconds, or by increasing the time period of the retardation device to any length of time necessary to avoid this danger. The number of false calls received from this source is remarkably few, but where it is desired to be entirely free from this trouble, a clockwork arrangement and an integrating mechanism are fitted to the receiving set, and two or more long dash signals of about four seconds each are employed. The clockwork is arranged to be started by the arrival of the first signal and automatically to reset itself and the apparatus at the end of 1½ minutes, so as to restore the set in case it has been accidentally started by a false call. The integrating mechanism consists of an electromagnetic step-by-step device which integrates the remainder of the long dashes and rings the bell when a predetermined number have arrived. Thus, if the prearranged calling signal is 10 long dashes, the step-by-step arrangement will be set to ring the bell at the conclusion of five, thus allowing a margin for some of the long dashes being merged into one by the intervals being filled up with jamming or atmospherics. The integrating mechanism as it moves on each step also resets relay No. 2 in fig. 2, so as to make it again available for the arrival of the next signal. It should be understood that there is nothing very novel in the design of this plant, but that the set is simply a combination of existing devices applied to wireless purposes.

THE DESIGN OF LIFTING TACKLE.

By J. T. TOWLSON.

It will be readily understood when it is stated that "The full story of bad lifting tackle can only be read in the records of Coroners' inquests, conjointly with the hospital casualty lists."

It is, moreover, undoubtedly true that the number of accidents, fatal and otherwise, which have occurred as a direct result of badly-designed eye-bolts would cover several full pages of such records and lists.

It is not altogether true that such accidents have happened because the lifting tackle, chains, hooks, and eye-bolts have not been sufficiently large or heavy, but rather (and this is the grand secret of strength) that some parts of a particular member have been too strong—in a precisely similar way as a steam boiler may be made liable to fracture by being stayed too rigidly.

Uniformity of strength, then, is the aim of the best designers of lifting tackle, and it will be found a patent and signal fact that it is not generally necessary to *add* to dimensions of the various members of standard lifting gear, but rather to reduce the heavy part, thus leading to uniformity.

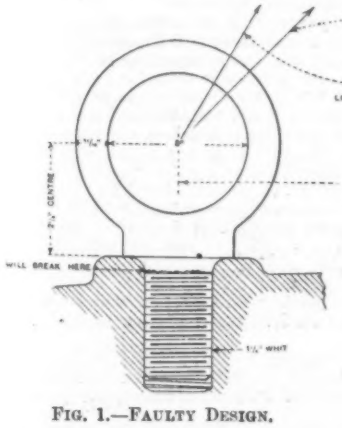


Fig. 1.—Faulty Design.

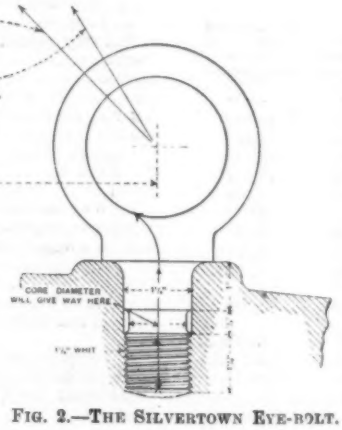


Fig. 2.—The Silvertown Eye-bolt.

The writer has seen the lifting chain of a set of double-hook chain blocks break on several occasions, and the chain has invariably broken at a link closely adjacent to the first heavy link next the hook. That link next the hook has been too strong for its neighbour, and greater safety would follow if that particular link were reduced in strength. The same applies to all chains which are employed for lifting, by passing one ring of a chain through the ring, or link, at the opposite end.

For the purpose of illustrating one concrete and dependable example where a reduction of diameter has resulted in a considerable increase of useful strength, one need go no further than the eye-bolt. If I wanted an eye-bolt to be treacherous, and to break, *and to break without warning*, one as shown in fig. 1 would be chosen. But if one was required that would stand rough usage, and a pull at bad angles, and one that would give way, and give notice ere it broke, and at the same time possess a useful strength over 200 per cent. beyond that of fig. 1, I would choose fig. 2. So the eye-bolt, shown in fig. 2, with the strength by reduction which the example typifies, the writer swears by.

The bolt, after various tests by the highest authority in Great Britain, has become "the standard" in several important electrical concerns, and the writer, as a safety-first man, hopes for and visualises the time when all such bolts as shown in fig. 1 will be condemned as unsafe, and officially disallowed. Both examples, fig. 1 and fig. 2, are represented as being applied for lifting the top half of a D.C. motor yoke, or the stator of an A.C. machine.

The eye-bolts being as shown, and 3 ft. 6 in. apart, the strain on them will be somewhat about 60° if a double chain of proper length is used.

It will be noticed, however, that, though fig. 1 would stand to suffer much with a shorter chain, and a larger included angle, fig. 2, by nature of its design, would hardly feel the difference.

Therein abides the dependability of fig. 2; it is considerably stronger than fig. 1, and can never break without warning.

These eye-bolts—hand-forged, of both types—have been tested to complete destruction at various "punishing" angles, by Messrs. Kircaldy Bros., and the verdict has been from 50 per cent. to 250 per cent. in favour of the "Silvertown Bolt," shown in No. 2 sketch. I call it the "Silvertown Bolt" for the simple reason that a well-known company at Silvertown fully adopted it on the designer's recommendation.

There is, obviously, nothing in the new bolt but what common sense dictates. No. 1, with its rigid ring and collar, and its fully-threaded screwed part, is designed to break—as we can easily see.

No. 2, with chains at an angle such as is shown, would all but lift its load, were the part that enters the load quite plain. So that the only strain which comes on the thread is in a line, straight and true in respect of its geometrical axis. The arrows depict the form and direction of the strains, and such were precisely followed in the exhaustive tests by Messrs. Kircaldy Bros.

The increased strength, as a result of decreased material, refers to the reduced part A, for this reduction is an effective

factor which contributes to the need that the strain of the load should be distributed over as large a volume of the composition of the bolt as is possible.

Anyone may see that with a bolt, as in fig. 1, and with a cross lift, such a bolt is actually dangerous. It will not only break—before it ought—but it will break suddenly.

ELECTRICITY IN ITALY: STATISTICAL DATA.

THE *Elettrotecnica* gives the following interesting details regarding the machinery employed in the Italian electrical industry. The machinery set up in Italy was, and is, to this hour, partly of native manufacture and partly imported. Up to the end of 1914 the principal sources of supply were Germany, Switzerland, America, Austria-Hungary, and England, the first two having the predominance. Foreign countries were the furnishers, as to-day, of the magnetic sheet-iron required by machinery builders. Up to the war this sheet was derived from Germany, and only to a small extent from England; since 1915, America and England have been the providers. It is to be hoped that at no distant date Italy will be able to supply her own needs. It is a question of industrial production which, while modest in itself, will have, nevertheless, a great influence on the life of this country.

Imports of Electrical Machinery.—During the period 1907 to 1917, the imports of electrical machinery were as shown in column 3 of the table which follows. A clear tendency to reduction is evident. In the last two years (1918—1920) importation has been half-extinguished, either by general commercial conditions or Governmental restrictions.

Imports of Magnetic Sheet-iron.—Considering the same period, 1907—1917, imports of magnetic sheet-iron tended, as is natural, to increase. In fact, while the yearly consumption of machinery has varied but little, a larger importation of sheet-iron was required as a set-off to the lessened imports. In the 10 years, 1908—1917, the average yearly importation of magnetic sheet-iron totalled 3,055 tons, its highest total, 4,644 tons, being reached in 1917. In the years 1913-14 (when the war was beginning) the average imports totalled 4,000 tons yearly.

Weight of Electrical Machinery.—Considering the total production of electrical machines, taken in the aggregate and not by fixed patterns of machine, the average weight of the finished machine may be taken as 18 kg. for each K.V.A. The relation between the weight of the raw magnetic sheet employed and the weight of the finished machine is about 0·42. These values refer to all the machines employed in this country, and consequently take account of the various patterns and dimensions according to which the large and the small machine enter into the total. Dividing by the ordinate of column 1 in the table below 0·42 gives the weight of the electrical machinery manufactured in Italy in the 11 years under review:—

Year.	1. Weight of magnetic sheet imported. Tons.	2. Weight of electrical machines made in Italy. Tons.	3. Weight of electrical machines imported. Tons.	4. Total weight of electrical machines employed in Italy. Tons.
1907 ...	1,862	4,450	6,070	10,520
1908 ...	1,542	3,700	10,520	14,220
1909 ...	1,918	4,550	8,987	13,537
1910 ...	2,220	5,300	8,274	13,574
1911 ...	2,415	5,800	7,475	13,275
1912 ...	3,330	7,900	6,834	14,734
1913 ...	4,090	9,800	5,479	15,279
1914 ...	3,790	9,100	7,271	16,371
1915 ...	2,576	6,200	2,385	8,585
1916 ...	4,033	9,600	2,386	11,896
1917 ...	4,644	11,000	3,002	14,002

Strictly regarded, account should be given in the above table of Italian exports of electrical material; but as these are very moderate, only 5 per cent. of the total, they may be sunk in the figures of Italian consumption. The figures of the imports given are from official sources; the others are deductions from considerations to be stated.

Electrical Machines Employed in Italy.—The total average demand for electrical machinery in Italy in the 10 years 1908-1917, was 13,550 tons per year (weight of the finished machine). Naturally, the weight of the corresponding raw material must go on increasing to make good depreciation, &c. Of the 13,550 tons, 7,300 tons are Italian produce, say, 54 per cent. of what the country calls for. In the period immediately forerunning the war (1913-1914), the weight of electrical machinery employed in Italy rose (average of two years) to 15,500 tons. The national production was 9,500 tons of finished machines, say, 61 per cent. of the total. Column 2 of the table shows that notwithstanding the accidental setback of 1915, Italian production increased more vigorously, and in 1917 the country supplied 78 per cent. of the total demand. One may forecast as likely a rise to 16,000 or 20,000 tons each year, with a corresponding weight of magnetic sheet of 6,500 or 8,500 tons, supposing the whole were produced in Italy.

The weight of a finished electrical machine is divisible into its principal components, as follows:—Cast-iron, 52 per cent.; magnetic sheet, 25 per cent.; copper, 12 per cent.; iron and steel, 11 per cent.

K.V.A. Installed in the 10 Years 1908-17.—As shown, the weight of the finished machinery employed in Italy in the period 1908-17, totals 135,500 tons. If, as pointed out, each K.V.A. corresponds to 18 kg., it follows that—

135,500,000/18 = 7,500,000 K.V.A. as the total power installed, that is, an average of 750,000 K.V.A. a year.

Hydraulic Turbines.—The period 1885-1917 may be looked on as embracing the start of electrical applications.

Before 1885 hydraulic motors as power factors were of small account. Of the turbines employed in Italy, there were between 1885-1917, of native manufacture, 1,567,349 H.P.; imported, 293,651 H.P.; or a total of 1,861,000 H.P., equal to 1,390,000 KW. In 1917 alone the power actually at work was only slightly below this figure, owing to machines out of service being included in the reckoning. The imports, almost exclusively Swiss, amounted to 15·8 per cent. of the total. The exports, almost negligible as an entity, were only 1 per cent. of the national output. As may be seen, the position of the industry is perfectly sound in this branch, and if we can say that 84·2 per cent. of the turbines in Italy were made in the country, the percentage since 1917 has certainly risen in Italy's favour. The power installed has rapidly grown from year to year in consequence of the expansion of electrical applications. As a matter of fact, while in the 13 years (1885-1907) Italy required 450,000 KW. of turbines, in the 10 following years (1908-17) there were 920,000 KW. called for. A further contrast arises, while in the former period 86 per cent. of the power of the turbines installed was used for electric purposes, in the latter period 95 per cent. was used to drive electric generators. The following tabulation shows the average and maximum power of the turbines installed:—

Years.	Average power.		Maximum power.	
1881-1890 ...	35 H.P.	25·7 KW.	300 H.P.	200 KW.
1891-1906 ...	265 ,,	195 ,,	3,000 ,,	2,200 ,,
1907-1916 ...	1,000 ,,	736 ,,	14,000 ,,	10,000 ,,
1917 ...	2,150 ,,	1,580 ,,	—	—
1918 ...	2,300 ,,	1,700 ,,	—	—

In the 10 years 1908-1917 the average weight of the finished machine, including regulating and working accessories, totalled about 12·5 kg. per H.P., or 16·6 kg. per KW. of turbine. This estimation, as in the case of the electric machines, takes account of type, power, model, &c., of the producing machines. On the basis of the above figures, the average weight of the hydraulic turbines employed in Italy from 1918-1917 is 17 × 92,000/1,000 = 1,560 tons. This weight is thus divisible—cast iron, 70 per cent.; iron and steel, 25 per cent.; bronze, 5 per cent.

Relation between Electrical Machines and Turbines.—As shown, there was, in the period 1908-17, employed in Italy 870,000 KW. of turbines installed to drive electrical machines; on the other hand, there was installed about 7,500,000 K.V.A. of electrical machines. Hence:

$$\frac{\text{K V.A. electrical machines of}}{\text{KW. of hydraulic turbines}} = \frac{7,500,000}{870,000} = 8{\cdot}6;$$

that is, 1 KW. of hydraulic turbines installed in central stations corresponds to 8·6 K.V.A. of electrical machines.

In another way the same outcome may be reached:

To 1 KW. of turbine corresponds about 1·4 K.V.A. of generator which may be raised to 2 K.V.A. to keep account of the corresponding thermic machines in the reserve and storage departments. It may be remembered that 1 K.V.A. for generators calls for 1 K.V.A. for transformers at the start, 1 K.V.A. for transformers at arrival, 1 K.V.A. for transformers at the secondary distribution, 1 K.V.A. for motors, 0·25 K.V.A. for sundry machines (regulators, synchronisers, converters, rotary transformers)—that is to say, a total of about 8·5 K.V.A. for electrical machines. Regarding the consumption of metal, it is to be noted that 1 KW. for turbine calls for 17 kg. of metal, and 8·6 × 18 = 155 kg. of electrical machinery in the station and the dependent departments (weight per finished machine). To this weight corresponds 155 × 0·42 = 65 kg. of raw magnetic sheet. A connection of special interest may be mentioned in conclusion between the KW. of turbine installed in Italy, and the weight of raw magnetic sheet per corresponding electrical machine:—1 KW. of hydraulic turbine calls for about 65 kg. of raw magnetic sheet iron.

A complement to the foregoing is the quantity of copper employed in mains and conductors in 1918. The figures relate to Continental Italy, within the old borders, including Sicily and Sardinia.

Kind of conductor.	Length of lines in km.	Weight of copper in tons.	Kg. of copper per linear metre of conductor.
High-tension air line ...	27,600	34,000	1·23
Low-tension distribution ditto	21,000	11,000	0·525
High-tension cable conductor	5,800	3,900	0·675
Low-tension ditto	5,600	6,100	1·915
			Total
Total km.	60,000	Tons 55,000	average 0·915

Copper employed in electric traction (tramways, secondary railways, State railways), or for transport lines, the property of the State, is not included.

Grain Elevators in South Africa.—*The Times* states that grain elevators are to be erected at Durban and Cape Town capable of dealing with 576,000 tons of maize per annum; also 71 elevators in other districts capable of dealing with 800,000 tons per annum.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

The Annual Convention at Ilkley.

(*Concluded from page* 41.)

Tariffs for Domestic Electricity Service.

By J. W. BEAUCHAMP, M.I.E.E.
Director and Secretary, British Electrical Development Association. (*Abstract.*)

In November last the E.D.A. made inquiries amongst engineers for their views upon domestic tariffs and single-meter systems. Briefly, the majority favoured a single-meter system and considered a fixed and running charge tariff essential for the development of domestic electrification; the general opinion also appeared to be that such a tariff would not affect the cost of wiring very much, and that the real difficulty lay in finding a basis for the fixed charge which should be sufficiently accurate and also appeal to the users' sense of equity.

I.—Principles.

A system which will secure al lthe fixed charges entailed by the consumers' use of supply, count all units, need only one meter, allow any circuit and outlet to be used for any purpose, and drop the average cost of the unit as the consumers' load factor rises, is the ideal in view.

The object of any tariff is to secure more business, and particularly to mould the character of additional business so that it becomes increasingly remunerative or results in lower average cost, which in turn enables lower basic rates to be charged to all consumers.

So far, in considering the subject of domestic tariffs, great attention has been given to the requirements of the individual consumer, his demand, hours of use, &c. It is one of the principal objects of these notes to question whether in designing domestic tariffs the time has not arrived when we should think less of the particular consumer and more of the effect caused by adding him to the remainder of the users, *i.e.*, his influence on the average.

It may simplify the formation of a domestic tariff basis to consider a number of average houses *en bloc*—a residential thoroughfare may be regarded in the same way as a block of flats, and its distributing main as a large service, the demand, and load factor, produced at the feed end of such cable being the items of chief importance and representing the combined operation of all the houses in a group.

It is apparently safe and equitable to start by charging a minimum amount which, varying somewhat with the seasons, shall not be less on the year than the cost entailed by the smallest service and meter which it is practicable to put in, its maintenance, and the expense of reading and handling the account.

In some cases such a minimum charge might exceed the value of 20 units per quarter at the statutory maximum rate per unit, but it would appear well to keep the minimum as low as possible and endeavour to meet the difficulty by securing somewhat longer loan periods for service cables and meters than are now generally allowed. Where ample maintenance is carried out at the expense of revenue it seems not unreasonable to expect easier terms for repayment with regard to items which experience has shown to be of a very permanent and lasting character.

Hitherto in most of the fixed and running charge tariffs the usual lighting account has been taken as the basis of the fixed charge, and if lighting only were used the largest portion of the bill would be represented by that fixed charge. The lighting basis is becoming more slender, whilst the peak-producing capacity of other household uses tends to increase, and we must look to cooking, heating, and power appliances to bear a portion of the standing charges on station and mains which their use will entail. So, in addition to the minimum, further fixed charges must be secured in relation to the capacity of apparatus of any kind installed, adjustment being made for diversity factors as determined by experience.

II.—Formation of a Practical Tariff.

Agreeing for the moment that the fixed charge must be in some way related to the consumer's maximum demand, the alternatives are to use a demand indicator or to formulate an estimate from time to time. The instrument method is objectionable on the score of cost, whilst the estimation method needs an amount of inspection which is never desirable, but the chief objections are that the basing of a fixed charge upon an instrument reading leaves the consumer uncertain as to the average price he will have to pay for the unit; predetermining a fixed charge by estimation leaves the supplier uncertain as to the average price he will secure for the unit.

Fixed and running charge tariffs have been based upon (*a*) rent; (*b*) rateable value; (*c*) apparatus installed; (*d*) maximum demand, observed or estimated; (*e*) size, number and purpose of rooms; (*f*) estimated allowance in units for normal lighting.

(*a*) and (*b*) are not always indicative of the demand. (*c*) checks growth of installation. (*d*) needs expensive instruments, or else is very rough and ready. (*e*) is promising, if not carried out too rigorously—*i.e.*, if based on class and type of house rather than on exact details. (*f*) Has given good results, but may raise difficulty as efficiency of lighting increases.

A relatively high fixed charge and a very low running charge is not likely to form a perfect and adaptable tariff; a mixture of (*e*) and (*f*) seems more promising. Say, for example:—

1. A fixed charge per annum, payable in equal quarterly instalments, or otherwise, to equal the amount payable at current flat lighting rates for a portion (say, two-thirds) of the lighting consumption normal to the house.
2. In addition all units used up to, say, 150 per cent. of the lighting consumption normal to the house to be charged at a rate equal to, say, one-third of the usual flat lighting rate.
3. All further units used to be charged at a rate as low as it is desired to offer for additional domestic consumption.

In this way the first item would regard the character and size of the house; the second item, the number and habits of the occupants; the third item, encourage fuller electrification.

In most districts information exists as to the average or normal consumption for lighting in houses (the H.F. and L. order figures could be used as a guide), and it should not be difficult to set up a scale in relation to the number of rooms and their size. It is necessary in this work to place more reliance upon averages than has usually been done.

An alternative method safer with regard to fixed charges and offering more encouragement to long-hour use is that of using one watt-hour meter for all purposes; taking into account the capacity of the electricity-consuming appliances connected; making a primary fixed charge at a certain rate per kilowatt per annum on a certain percentage of the capacity represented by some of the appliances in use; making an additional and secondary fixed charge at a different and lower rate per kilowatt per annum on certain percentages of the capacity represented by the other appliances in use; making a flat-rate charge per unit for all units consumed for any purpose; imposing a minimum on the account as provided by statute or in some less amount.

Obviously the secondary fixed charge could be avoided and all capacity calculated at a single rate per KW. for fixed charge, the percentages taken as rateable varying with each class of apparatus to cover the different diversities of use and to allow for the different economic values of the unit to the consumer as represented by lighting, cooking, and other uses.

If it were practicable, and it may become so, it would be very desirable to associate the fixed charges with the size of the consumer's fuse—to sell him, so to speak, a fuse capacity or a circuit-breaking setting at so much per year. This is but a variant of the current-limiting system, and may be worth a little more study by inventors.

III.—Demand and Diversity.

Naturally it is desirable to keep internal wiring as simple as possible, but there appears room still further to explore the idea of alternative switching with a view to keeping down the peak demand and improving the load factor of a house. Patents have been taken out for cookers in which the switches of various parts are so arranged that the whole of the cooker capacity cannot be put on at once. Devices of this kind must be kept near the apparatus, or wiring becomes complicated and costly.

The more we move towards the electrical kitchen the more the principle becomes easily applicable. For instance, pieces of apparatus like washing machines, general utility motors, &c., might be switched alternatively with the cooker so that either could be used, but not both at once.

The general use of electricity in dwellings upon a large scale will certainly bring business of a magnitude hardly foreseen to-day, but it will require foresight and a certain adventurous courage with regard to distribution expenditure. It would appear that our residence networks must be put down in advance on generous lines, and their cost met as soon as may be by extensive selling campaigns, hire of appliances, and a simple attractive tariff.

Supplementary Notes.

The Supply of Electricity to Small Dwellings in Continental Cities.

In 1914 electricity was used for lighting in cottages and tenement houses on a very extensive scale, and almost exclusively by means of "contract" tariffs without a meter. In many cases electricity replaced oil lamps, and acute gas competition had not to be encountered; wiring and fittings of the simplest descriptions were employed, the standard of lighting provided

also being low in comparison with British ideas. Similarly overhead mains work of the simplest and plainest description, coupled with rather wide limits of pressure regulation, combined to offer a lighting service better than the one replaced, but crude and inexpensive compared with the provisions which have generally been insisted on in this country (extreme simplicity in the electrical methods securing an economic advantage over the necessarily more rigid sistems of gas distribution). During the war, shortage of coal and oil caused rapid extension of electric lighting in some areas rather on the grounds of necessity than anything else.

The general use of "contract" tariffs has led to great simplification of accountancy and collection, the bills taking the form of tickets or ration cards.

Current limiters form a feature of many of these schemes, whilst some introduce an interesting variation by charging for extra lamps or circuits at reduced rates subject to their control by change-over switches, "alternative switching" thus increasing load factor.

On most of the systems wiring and fittings are provided on hire-purchase, extremely low monthly payments being taken (*e.g.*, 2d. per month, pre-war price, for a plain ceiling fitting and reflector, with possession in three years).

In many of these supply areas special canvassing and publicity methods have been employed to attract the small user, the canvassers being, in some cases, trained workmen of the same social grade as the cottage and flat dwellers whom it is desired to secure. The contract system is stated to act as a good and safe introduction to the use of electricity, often resulting in the consumer adopting appliances for heating, &c., and asking to be charged by meter.

Waste of electricity under this system of charging does not appear to be serious (in such small property the limited maximum demand is often less than sufficient to operate even a flat iron); it is pointed out that the shunt losses in a small meter may account to 12 or more units per annum, so that a normal consumption of 72 units (two 30-watt lamps for 1,200 hours) may be increased by 15 per cent. on account of waste before the saving in energy alone due to dispensing with a meter is reached. Waste in lighting generally occurs off-peak.

The argument that a contract system is unfair as between the careful and the careless consumer is met by pointing out that so large a proportion of the total cost of supply is independent of units delivered (between, say, 10 and 25 per cent. load factor) that the injustice is less than where meters are used, when very short-hour consumers generally get the same rate as the normal users, and so secure an undeserved advantage over them.

The consumer who wastes units on a "contract" charge causes less loss to the supplier than one whose consumption is abnormally low on a "flat rate" charge.

In some areas "assisted wiring" has been effected by allowing free supply up to the value of the installation during the first year, subject to guarantee of a similar account for two or three succeeding years; obviously installation costs must be low where this method has succeeded. In England to-day the cost of wiring a small house may easily be equivalent to three or four years' electric lighting account.

Power supplies have also been given to a considerable extent on contract systems, particularly in agricultural districts, prices per KW.-year for "day work" and for "night and day work" being quoted with little restriction.

The growing use of electricity for purposes not foreseen a few years ago seems, however, likely to call for more precise methods on the grounds of equity alone even where "running costs" are low.

The following system has been adopted by the Hydro-electric Power Commission of Ontario:—

Domestic Service.

All electrical energy used for domestic or household purposes except as provided for in Clause 18 will be charged at the domestic rates.

The charge for domestic service will consist of a service or floor-area rate, plus consumption or kilowatt-hour rates, as follows:—

Service rate.—A rate per month per 100 sq. ft. of floor area.

Consumption rates.—(1) For all consumption up to 3 KW.-hour per month for each 100 sq. ft. of floor area charged. (2) For all remaining consumption.

The floor area of a house is obtained by taking its outside dimensions, omitting bay windows and similar projections. The area derived from these dimensions multiplied by the number of floors and reduced by 10 per cent., and taken to the nearest 100 sq. ft. gives the area on which charges are based. Exclude verandas, basements, unfinished attics, and outbuildings, except where used for living or sleeping purposes, in which case the net area so used will be charged for.

The minimum service charge in cities and towns will be on 1,000 sq. ft. of floor area; in villages and police villages on 1,200 sq. ft; and in suburban districts on 1,500 sq. ft. The maximum service charge will be on 3,000 sq. ft.

There will be no optional consumption rate or omission of the service charge for domestic service, nor will any flat rate contracts be permitted.

No electrical energy for domestic service will be sold at power rates.

Where small single-phase motors, heating or cooking appliances, or other electrical devices are used for domestic purposes there will be no additional service charge therefor. The energy so used will be included with the other domestic consumption.

Free porch or other lights will not be allowed. There will be no free lamp renewals. Lamps and appliances may be furnished by the municipality at prices approved by the Hydro-electric Power Commission of Ontario.

Wherever small stores with dwellings are supplied through the same service, the consumer may be billed at either the domestic or the commercial lighting rates, according to the mutual agreement between the consumer and the Corporation.

Discussion.

Introducing his paper, Mr. BEAUCHAMP remarked that in considering tariffs now they must bear in mind the Electricity Commissioners and the question of unification. It was very desirable that the equity of the tariff should be capable of demonstration to the consumer. Electricity supply should be developed for small domestic power, heating, and, above all, cooking; great changes in cooking apparatus were coming, and manufacturers were very busy.

Mr. PURSE expressed his profound disagreement with the author's views; any tariff such as he suggested would puzzle the consumer, and no tariff based on the number of rooms or the rateable value could be universal—they must always offer an optional flat rate. The rateable value system brought little business but much worry. Cutting prices to get the domestic load would help the manufacturers at the expense of the supply undertakings. The power load was far more valuable. They looked upon the heating and cooking load as a by-product, but it might become the main load, and what would happen then? There was no need to tempt the domestic load with a low tariff; the price was immaterial—the saving of labour made it worth while. They would come back to some form of maximum-demand tariff, and an improved M.D. indicator was needed. They should pay for meters and services out of revenue, and they could not afford to be generous with the mains at present prices.

Mr. DYKES said that if the Electricity Commissioners would allow a very high maximum, they could offer alternative tariffs which would pay both supplier and consumer. They would have to frame some tariff which depended on the demand of a consumer. Ten years ago he had put forward the "contract demand" system, but the consumer never knew what he would have to pay; a simple piece of apparatus was needed to warn him when his maximum demand limit was being approached, without cutting him off. He still thought it a promising system; it covered the standing charges, and allowed the use of all kinds of apparatus. The two-rate system was still a good one; the consumer could be given the option of putting in the extra meter, and the change-over device could cut out the M.D. indicator during the off-peak period. That small consumers were still using gas for lighting was a standing disgrace; electricity would cost them less. Thousands of lamps had been connected on the "fixed-price light" system, which covered the cost of wiring, &c., and was a very good system indeed. It brought in 15 or 16 shillings per lamp per annum, and had a great future. It was easy to get 2 rupees per month per 20-watt lamp in the Indian bazaars, and the same thing could be done here.

Lieut.-Col. VIGNOLES remarked that in his paper of 1914, which dealt with the same problem, a suggestion was made which led to the formation of the "E.D.A." The fixed charges had greatly increased, and unless domestic consumers took electricity for other purposes than lighting the price would have to be much higher than 8d. a unit. Some tariff such as the author suggested, with a fixed and a running charge, would afford a solution. He had adopted the "telephone" system in his town, which did not give much trouble, but a system of inspection was necessary. The individual should not be considered too closely—the aggregate maximum demand was what affected the station. They must give the consumer satisfaction, and see that he really got heat, and good cooking. He suggested that the Convention should appoint a committee of engineers to take Mr. Beauchamp's paper as a basis and report on the subject.

Mr. C. H. WORDINGHAM pointed out that the electrical industry had become a very large one, and they could not make pets of individual consumers. No other industry used such a variety of tariffs—he knew of nineteen different schemes. Ought the charge to be proportional to the cost of production, or to the value of the service rendered? The consensus of opinion of engineers was in favour of the former principle, which was the view of Dr. John Hopkinson in 1893, and was constantly being rediscovered. In a sound tariff nothing should be left to the judgment of an official, the price should be proportional to the cost of prduction the methods should be the same for all, and the maximum demand on the station should be the determining factor. The flat rate was entirely wrong, and was only due to the Act of Parliament. A contrast price per lamp per annum was hopelessly wrong, the rateable value a false basis, and the size of rooms an objectionable criterion—they should get rid of all inquisitorial methods.

Mr. E. E. HOADLEY said tariffs were usually too complicated or too unfair; but every system must be a compromise between equity and expediency. In his town there was a big

power load, but also a big field for the domestic load. He had adopted the "telephone" system, based on the number of lamps installed, but too much prominence had been given to the lighting load; where electric lighting and gas cooking were employed, the gas bill was three or four times the electricity bill, and evidently stronger effort should be made to get the cooking load. A few appliances could be supplied through the lighting wiring, but now 3- to 6-KW. radiators were becoming common, which could not be put on the lighting wiring. It might be worth while to charge differently for lighting from other uses—say, contract demand for lighting, and a flat rate for everything else, on separate wiring. In new blocks of houses, he suggested running a heavy wire to one point in each room, tapping off through small fuses for lighting, and providing plugs for heating and cooking. He had connected up a very large number of heating devices, which were much used for occasional heating in the morning, but had little effect in the afternoon and on the peak load. The difficulty of heating water might be met by a simple device to divert the lighting current to the water-heating apparatus when light was not required.

Major H. RICHARDSON said the basic principle was already standardised—a standing or service charge in addition to a small running charge. He offered a high flat rate, and an alternative tariff under three headings: Industrial power users; shops, warehouses, and offices, and domestic consumers. The running charge in all cases was ½d. per unit, and the standing charge was based on the demand, which was easily ascertained in the case of large users, but not in that of small ones. He found that the floor space afforded the closest approximation to the demand, and made the fixed charge 2s. per 100 sq. ft. of living rooms, per quarter. Shops were charged at a higher rate, having a worse load factor. It was a simple tariff.

Bailie SMITH said that a very good system of covering the standing charges was to charge for an average use of 800 hours per year of the lighting demand at 4½d. per unit, and after that ½d. per unit. That tariff satisfied consumers, involved no loss, required only one meter, and allowed of the use of electrical appliances fed from a lampholder in any room.

Mr. L. L. ROBINSON said the only true method was that of Hopkinson, as developed by Mr. Arthur Wright. The various systems discussed were only means of complicating the Wright system. They must still have a flat rate for the large class who always wanted to pay for what it burned, and that rate should cover the short-period use—1½ hours' use of the maximum demand per day. The charge for heating should not be below that for power; when a station developed maximum demands at 10 a.m. and 3 p.m., the addition of the heating load, which on a cold day might amount to 1,000 KW., was a serious matter. At Hackney they had a variety of tariffs, because people who moved in from other areas wanted the tariff they had been used to. He found that the "telephone" system was not popular; the high flat rate and the M.D. system were the favourites.

Mr. LONG said the rateable-value system had been very satisfactory at Norwich. They must have a fixed and a running charge, the latter being as low as possible. More information regarding the load factor of the cooking load was desirable. "Occasional" heating did not affect the peak load; coal fires should still be used for living rooms, with radiators only for occasional heating.

In a brief reply, Mr. BEAUCHAMP said he did not differ much from Mr. Purse. He agreed with him regarding the cost and delivery of cookers, but manufacturers were preparing to make them more cheaply and in large quantities—wonderful improvements were on the way. He wanted the manufacturers to let him tell the Association what was coming, and would ask the members to say what *they* were doing to prepare the way.

Annual Report.

THE membership of the Association stands at 399, made up as follows:—

Committee members	188
Chief electrical engineers (members) ...	184
Honorary members	8
Chief assistants (associate members) ...	2
Assistants (associates)	17
	399

During the year 12 chief engineers and seven electricity committees have joined the Association, while 17 engineers have resigned on leaving municipal employ.

On the resignation of Ald. G. Pearson, honorary solicitor, the Council appointed Mr. P. M. Heath, deputy town clerk of Manchester, to this position.

The Council has appointed eight standing committees, namely:—

Executive Committee (in future to be called Emergency Committee); Finance and General Purposes Committee; Editing Committee; Centres Committee; Remuneration and Conditions of Employment of Chief Engineers Committee; Remuneration and Conditions of Employment of Staff and Employés Committee; Selection Committee; and Law and Parliamentary Committee.

An "Agreements" Committee has also been appointed to deal with the preparation of any standard forms of agreements for which a need may arise. The committee, in conjunction with the hon. solicitor, is drawing up a standard form of hiring agreement, and at a later date the preparation of an agreement for wayleaves for overhead lines will receive attention.

The British Electrical Development Association (Inc.), of which the I.M.E.A. is a founder, with six representatives upon its Council, is mentioned with cordial approval, and the Council urges all members of the I.M.E.A. to join it.

The B.E.D.A., in addition to its normal work of publicity, has given assistance to the Council on a number of important matters, and is undoubtedly spending its resources with effect and assisting to maintain that good will and interest on the part of the community which are so necessary to the welfare of any great public service.

Last autumn the Council was asked by the B.E.A.M.A. to render assistance in resisting the free importation of American heating and cooking apparatus. It was felt, however, that in view of the fact that this class of apparatus is undergoing a process of rapid development, it was desirable that new ideas and designs should be obtained and tested, and the Council therefore decided that it was not advisable to support this action. The Council also decided to form a Committee with the B.E.A.M.A. to go fully into the existing position with regard to cooking and heating apparatus, with a view to possible improvements. This work has now been taken over by the British Electrical Development Association, and investigations are in progress.

The National Joint Industrial Council for the Electricity Supply Industry has now been in existence over a year, and thirteen District Councils (practically all of which are working) have been arranged.

The expenses of the Council were estimated at £500 for the 12 months, and, in proportion to representation, the I.M.E.A. has had to find one-quarter of this amount. This is a heavy call upon the revenue of the Association, already faced with a deficit from last year of £88.

In November, the Electrical Power Engineers' Association (E.P.E.A.) approached the N.J.I.C. and asked that their rates of salaries and conditions of employment, &c., might receive consideration. As the trade unions object to staff associations being represented on their side, and the Ministry of Labour will not agree to two Industrial Councils for the one industry, a conference of employers and the E.P.E.A. met at the Ministry of Labour, a member of the Ministry being present, and agreed to establish a Joint Board of Employers and Staff Associations. The associations represented on the employers' side of the National Joint Industrial Council were asked if they concurred, and, on their consent being obtained, the board was duly set up. The staff side of this board includes, in addition to the E.P.E.A., other associations which are not represented on the employés' side of the National Joint Industrial Council, such as the Electricity Supply Commercial Association. The board is divided into sub-committees with four a side to deal with the separate interests.

Considerable doubt seems to exist amongst the members of the I.M.E.A. as to how far they are bound by the findings of the National Joint Industrial Council and the Joint Board of Employers and Staff Associations. The Minister of Labour has stated that the findings of the various Industrial Councils cannot be made binding until the unions and employers' associations are mutually agreed that the same shall be made binding on all parties to the agreement. The Council of the I.M.E.A., however, considers that as the Industrial Council for the electricity supply industry is composed on the employers' side of six I.M.E.A. representatives out of a total of twelve, the undertakings belonging to the Association should adopt the decisions arrived at.

The Council appointed a committee to act jointly with the B.E.A.M.A. on the various matters affecting the interests of the Members of the two associations, and sub-committees have provisionally agreed to standard schedules of guarantees and performances to be embodied in specifications for turbo-alternators and cooling towers.

The Electric Vehicle Committee of Great Britain continues to do good work in promoting the adoption and use of electric battery vehicles. Its efforts are reflected in the rapidly increasing numbers of such vehicles which are being brought into use. The committee is now considering a proposal for the formation of an Electric Vehicle Association into which it will be merged.

The following scale of subscriptions was proposed:—

Undertakings with an output of under 5 million units per annum, 5 guineas.

Undertakings with an output of over 5 millions but under 20 millions, 10 guineas.

Undertakings with an output of over 20 millions, 15 guineas.

The Council felt that as the Association now represented only the interests of employers, it was desirable that one payment should be made by each electricity supply undertaking to cover membership of both its committee, as represented by one member, and its chief engineer.

The increased subscriptions, which the majority of undertakings have agreed to pay, will enable the Council, it is

hoped, to meet the expenditure for the ensuing year, but should it become necessary for the Association to have its own offices and a paid technical secretary, it is certain that the subscriptions will have to be still further increased.

The accounts for the year show total income £940, expenditure £1,044, leaving a deficit of £104. The balance sheet shows a credit balance of £724 on March 31st, 1920.

At the annual general meeting, on June 25th, the new standing orders were unanimously adopted, as were also the annual report and accounts.

Mr H. FARADAY PROCTOR moved a resolution that had been passed by the Council, to the effect that no effective progress could be made by joint electricity authorities without satisfactory financial arrangements, and that the financial clauses of the amending Bill should be passed at the earliest possible date. Already considerable difficulties had arisen, he said, in drawing up schemes, for want of these clauses, which were absolutely indispensable. In one draft scheme, which was in a very forward state, financial clauses had been inserted on the lines of those in the Bill; but they were useless unless covered by the new Act. The resolution was carried unanimously.

Councillor TURNER moved a resolution recording the opinion of the Association that in connection with any scheme that might be put in operation, the control of the generation and main transmission lines should be placed in the hands of duly elected public representatives of the districts served. This was on the lines of a resolution adopted by Bradford Corporation. The difficulties immediately ahead, he said, could not be successfully met unless certain areas were left to provide their own supply without complications due to joint ownership. A delay of even a few years would be disastrous. The matter was discussed for some time, both for and against. It was pointed out that if the municipalities wanted entire control, they would have to find all the money, and that in some areas companies would have to be bought out at great cost. Councillor Turner explained that the resolution did not exclude the representation of large consumers, &c.—provided that their representatives were "duly elected"—and it was carried unanimously.

A motion by Lieut.-Col. VIGNOLES, that a committee be appointed to consider the question of developing the sale of electricity for domestic purposes, having regard especially to tariffs, was adopted.

Alderman JEPHCOTT, M.P., moved a resolution that all agreements, recommendations, or awards of the National Joint Board or Council should be complied with by the local authorities connected with the Association. Some authorities, he said, were failing in their duty in this respect, and that would ruin the Whitley scheme.

Alderman WALKER seconded, emphasising the national character of the awards, which, therefore, must be upheld. Nothing stimulated trouble with the men so much as discordant action. The authority of the National Joint Board, called in question, was described by Ald. Beaumont as being the same as that of the Industrial Council—namely, the sanction of the Ministry of Labour. Unfortunately, in London, when a recent award was made with the approval of the company representatives, the companies refused to comply with it, and resigned from the Board; this had brought about an extremely awkward situation. Ald. Beaumont said he had seen the improvement in the relations between the parties due to bringing them together, and he believed there was a satisfactory future before these organisations—but agreements must be honoured, if good results were to be obtained. Mr. Webber pointed out that some authorities went too far, and granted more than the award; Bradford Tramways had erred conspicuously in this respect. They should abide by the recommendation, and not go beyond it without consulting the Board or Council. The resolution was adopted unanimously. The result of the ballot for officers was reported, as given on p. 6 of our issue of July 2nd. The new scale of subscriptions was agreed to, and the proceedings closed with votes of thanks to the retiring president (Mr. Thomas Roles), and the committees and officials who had assisted in the preparations for the Convention.

THE AERO EXHIBITION.

AT the first Aero Exhibition, held in 1909, exhibitors were asked: "Will your machine fly?" To-day, 11 years later, comes the fascinating Olympia Exhibition, revealing developments in aviation that can only be described as wonderful. The 1920 Exhibition, which is the first post-war show and the sixth of the series held under the joint management of the Society of British Aircraft Constructors, Ltd., and the Society of Motor Manufacturers and Traders, Ltd., was opened at Olympia, London, W., on July 9th, by Lord Londonderry, Under-Secretary of State for Air, and remains open until the 20th inst.

The show has been described as the best of its kind yet held anywhere, and as an indication of its importance it suffices to record that deputations or representatives have been sent by countries in every part of the world, including Japan, Sweden, Poland, Holland, Belgium, Canada, Brazil, Australia, the Argentine, Rumania, France, Tasmania, Peru, and Greece.

Not so long ago a subject for jest, fear, and wonder, aircraft has to-day become a definite factor in methods of transportation, and the collection of flying machines and component parts displayed at Olympia is at once educational and unique. In the course of a speech at the opening ceremony, Major-General Sir F. H. Sykes, Controller-General of Civil Aviation, said: "We have conquered the air, and our immediate task is to exploit our victory in the interest of commercial development." Figures given by the General for the first year of civil flying were:—Number of flights, 38,954; mileage flown, 734,200; passengers carried, 70,000 (only one met with a fatal accident); goods carried, 116,498 lb.; aerodromes licensed, 114; machines registered, 519. Up to the end of March last, over £200,000 worth of imports and exports were carried by air between this country and the Continent.

The exhibition is divided into three sections:—(A) Aircraft; (B) aero engines; and (C) propellers, models, components, and accessories. Kinematograph displays and lectures are given daily by arrangement with the Royal Aeronautical Society. In the main hall some 100 exhibits are on view; of these, 10 firms display accessory electrical apparatus, as follows:—

BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Several types of magnetos as used during the war, shown in the form of sectional models, and actually operating at high and low speeds. A number of "Mazda" electric lamp bulbs, and "Fabroil" noiseless pinions and gears.

BROWN BROS., LTD., London.—Electrically-heated clothing, instruments, lamps, generators, wire, switches, and other accessories.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., London.—Aircraft and portable wireless telegraph and telephone installations and apparatus, and a marine type direction-finding outfit.

RIPAULTS, LTD., London.—"Oleo" sparking plugs for aero engines, and electrical accessories.

AUTOMATIC TELEGRAPH CO., London.—The "One-Lever" automatic wireless transmitter, which will be described and illustrated in a later issue.

MR. A. E. PARNACOTT, London.—Electric cable terminals, sparking plugs, and a sparking-plug testing machine.

SIMMS MOTOR UNITS (1920), LTD., London.—High-tension magnetos of various types; sparking plugs, "Vernier" flexible magneto couplings, and magnetic petrol gauges.

NORTH & SONS, LTD., Watford.—Magnetos and revolution indicators for aero engines.

TELEPHONE MANUFACTURING CO. (1920), LTD., London.—Intercommunication telephones of many types and sizes, including the "Laryngaphone" for mine-rescue and aviation purposes, and a number of accessories.

S. SMITH & SONS (MOTOR ACCESSORIES), LTD., London.—Types of aero models of K.C.G. sparking plugs and M-L magnetos.

ROBINHOOD ENGINEERING WORKS, LTD., London.—Sparking plugs of the K.L.G. type and precision tools of various kinds.

The historical exhibit in the annexe is loaned by the AIR-CRAFT DISPOSAL CO., LTD., London, and includes a number of different types of complete machines together with engines, equipment, and accessories, all of which are for disposal. This company holds large stocks of electrical accessories of many different makes and types, such as magnetos, sparking plugs, accumulators, instruments, telephones, &c., samples of which are on view.

THE AIR MINISTRY'S section is accommodated in the gallery, which is given over to the technical departments of the R.A.F. The section comprises models; devices for ensuring safety and reliability; testing of aircraft, materials and accessories; instruments; wireless telegraphy and telephony; medical tests; meteorological apparatus, &c. In the testing sections interesting electrical methods and instruments are on view. The "Shakespeare" permeameter tests the gas-tightness of fabric; as the gas permeates through the material it comes in contact with platinum wires, the resistance of which is thereby altered, causing the flow of the electric current through them to alter. From these variations it is possible to calculate the amount of gas that escapes through the

fabric in a given time. An electric muffle furnace for the heat treatment of small specimens, an electric gyro turn indicator, and tests of thermionic valves, wireless telephone transmitters, receivers, and generators are shown. An X-ray apparatus is exhibited, together with samples of faults in materials and defective workmanship, which are not visible to the eye, but are detected by means of X-ray photographs. A number of magnetos, spark plugs, armatures, condensers, distributors, &c., are shown undergoing tests. In the Communications Section a 10-in. petrol-electric searchlight, navigation, recognition, and other forms of lights, together with wind-driven generators, and batteries, are shown. Finally, in the Wireless Section an aeroplane fuselage is fitted with a working wireless telephone outfit, the operation of which is demonstrated, and the instruments exhibited include a number of different types of transmitters, spark and continuous-wave cabinets as fitted in aircraft, tuners, amplifiers, receivers, relays, and other devices, some of which are of historical interest.

LEGAL.

The Assessment of Electric Motors.

According to the Scottish Press, the Valuation Appeal Court on Saturday last decided a test case which rules over 2,000 Glasgow appeals.

The Assessor for Glasgow entered in the supplementary valuation roll a large number of electric motors owned and used by tenants for commercial purposes.

The Valuation Committee decided that while the motors were machinery fixed or attached, in respect that they were plant for producing or transmitting first motive power, they were not erections or structural improvements in terms of the Act.

The Assessor appealed, and Court sustained the appeal, setting aside the finding of the Valuation Committee.

The Court held that the motors were machines for producing or transmitting first motor power, and were exactly comparable to gas engines or steam engines; and that the fact that the motors could be removed without removing any part of the building, did not disqualify them from being assessed.

Workmen's Compensation.

In the City of London Court, on Monday, Frederick Westley, quartermaster, Forest Gate, claimed compensation under the Workmen's Compensation Act against the Telegraph Construction & Maintenance Co., Ltd., for an accident that happened to him on December 11th on the cable ship *Colonia* while lying off Enderby's Wharf, when he slipped and fell 40 feet into an ash boat. His spine and right lower ribs were injured, there was shock to the system, and other injuries. His earnings were £15 per month and provisions and quarters.

Mr. W. E. Singleton, plaintiff's solicitor, said all he wanted was a declaration of liability. Westley was rejoining his ship at full wages, and he had been paid all the compensation to which he was entitled. The underwriters had consented, but they did not think the present application should have been made. It was, however, inevitable.

Judge Atherley-Jones, K.C., concurred, and made a declaration of liability, and gave the costs.

British Thomson-Houston Co., Ltd., *v.* Corona Lamp Works, Ltd.

In the Court of Appeal, on July 13th, this came on for hearing upon the appeal of the plaintiffs from the judgment of Mr. Justice Sargant. The hearing was adjourned.

Marconi's Wireless Telegraph Co., Ltd., *v.* Hamilton.

It has been arranged that this action shall be down for hearing on July 28th, in order to meet counsel's convenience.

BUSINESS NOTES.

The "Electrical Review" Index.—The Index to Vol. 86 of the Electrical Review, which will shortly be printed, will be supplied only to those who, through the post, specially apply for it. To such it will be supplied for sixpence post free. Any reader or advertiser, at home or abroad, who requires a copy for binding or for other purposes, is asked to make early application therefor to the Publisher, Electrical Review, 4, Ludgate Hill, London, E.C. 4.

German Companies.—Under the style of the Mitteldeutsche Stickstoffwerke A.-G. has been formed in Berlin a company, with a capital of 60,000,000 marks, all but 4,000 marks of which has been subscribed by Government officials. The objects of the company are the manufacture and sale of nitrates and other chemical manures and products, in works already existing at Piesteritz.

The great demand for, and the scarcity of, electrotechnical porcelain since the end of the war, primarily occasioned by the insufficiency in the supply of coal, has led the producers and users to make common representations to the Government, with the outcome that a Regulation has been issued giving preference in export to moulded porcelain used in electric installations. This article figures in the State Goods List under the export No. 912 *e*.

The V.D.E.—The Verband Deutscher Elektrotechniker (German Electrotechnical Union) will hold its yearly meeting and "Electrical Week" this year at Hanover, from September 23rd to 29th. Some eight electrotechnical societies will take part. Numerous lectures will be given, and an exhibition of electrotechnical novelties will be held.

F.B.I. and National Expenditure.—Last week the Federation of British Industries sent to the Prime Minister a long and important communication on the subject of national expenditure and taxation. The Chancellor's attitude has been that he was carrying out the Government's decision in adhering to a programme of taxation necessitated by the Government's scale of expenditure. As taxation cannot be reduced until expenditure falls, the F.B.I. has offered its criticisms, and suggested directions in which economy might be effected. A Financial Council, sitting under the chairmanship of the Chancellor of the Exchequer, is proposed, its membership consisting of independent men selected for their wide financial or business experience, assisted by the senior permanent officials of the principal Government departments.

Australia.—H.M. Trade Commissioner at Sydney reports that a local company desires to undertake the sole Australian agency of a British firm for electric wires and cables. The name and address of the company referred to may be obtained by United Kingdom manufacturers interested, on application to the Department of Overseas Trade.

Address Required.—Messrs. Cook & Co., who sent us an inquiry regarding voltmeters and ammeters, are requested to forward their full address to enable us to reply.

Company Registrations.—In their table of company registrations at Somerset House between January 1st and June 30th, 1920, Messrs. Jordan & Sons, Ltd., give the following figures:—

	Number.	*Capital.*
Electric, gas, &c.	115	£3,450,200
Engineers	288	8,679,300
Telephones	6	1,622,000

Inquiry from Turkey.—The Commercial Secretary to the British High Commission at Constantinople (Capt. C. H. Courthope Munroe) in a recent dispatch states that he has received an inquiry for the name of a United Kingdom manufacturer of telephones with magnetos, all telephone accessories, telephone wires and an exchange of 500/600 lines; also electric bells, wires, batteries, &c. The inquiry is from the Concessionaire of the telephone system at Samsoun (Asia Minor). Correspondence and catalogues should be addressed to the British High Commissioner's Representative at Samsoun, under cover to the Commercial Secretary at Constantinople.

Our Trade with Siam.—During the year ended March 1st, 1914, the imports into Bangkok direct from England included £22,768 of electrical goods and apparatus. The Acting Consul-General at Bangkok in a report on the commercial situation in Siam at the end of 1919 mentions that the war has led to a cessation of supplies from the United Kingdom, of carriages, cars, electrical goods and apparatus, &c. It is thought by some that Japan will retain its hold principally upon the cheap lines, of which Germany had a virtual monopoly in the past. American competition is more to be expected, says the Acting-Consul. The American exporter is learning to understand Eastern markets every day. "A Bangkok importer of iron, steel, and machinery, is more apprehensive of future competition from German than from American sources; he notices that the Germans are already endeavouring to come into the Siam market again, and he points out that the present low exchange value of the mark is all in their favour." At even prices the most Asiatic traders prefer British manufactured goods to those of any other nationality, but that does not absolve the British manufacturer from the necessity of putting forth every effort to meet foreign competition.

J. and P. Branch at Sydney.—Messrs. Johnson and Phillips, Ltd., have opened a new depôt at Sydney (212, Clarence Street), as their Australian headquarters. Their business in Australia is under the control of their branch manager, Mr. E. A. Kingsley, who carries large stocks of cables, wires, &c., at the address stated.

Foreign Trade.— June Figures.—The following are the values of imports and exports of electrical goods and machinery in June :—

	June. 1920.	*Inc. or dec.*	*6 months,* 1920 *Inc. or dec.*
Imports.	£	£	£
Electrical goods, &c. ...	124,372	+ 48,020	— 71,679
Machinery	1,717,897	+ 670,011	+ 1,638,355
Exports.			
Electrical goods, &c. ...	1,212,360	+ 722,628	+ 3,089,212
Machinery	5,026,283	+2,577,450	+11,929,518
Re-exports.			
Electrical goods, &c. ...	10,269	+ 5,500	+ 13,959
Machinery	159,920	+ 87,270	+ 437,266

Electrical Fittings Trade in Italy.—According to a report by H.M. Consul at Turin, while the demand for all kinds of electric fittings continues large, conditions have changed much of late, as various local companies have been formed for the manufacture of these goods. Among the new concerns may be mentioned Cinzio Barosi, of Milan, with a capital of 2,000,000 lire, for the manufacture of electric heating and cooking apparatus. The market is consequently overrun with these goods, and British manufacturers will have strong local competition to meet. At the same time, however, there is a great scarcity of all kinds of good electric light fittings, which will take a long time to satisfy. French, German, and Swiss competition will have to be reckoned with as soon as production permits, and several newly-established companies in Milan are preparing to meet the demand. There is also some importation from the United States, Spain, and Japan. When, as now, the supply is not equal to the demand, everything sells as quickly as it arrives. Otherwise, the trade is largely of a seasonal character. It slackens during the early summer, but revives again in August for inside plants and in the spring for outside plants. The best means of trading is through a British export house with local branches, travellers, &c., or through locally-established Italian concerns. The most essential point is to offer goods ready for early delivery, which will find a good market provided prices are moderate. Payment is generally effected on receipt of the goods, or at 30 to 60 days after the date of the invoice. Card boxes for small articles and wood boxes for the larger are recommended, the cost of the packing cases to be paid by the buyer. It is always better to give prices c i f. Genoa, if possible. National or local regulations affecting types of goods offered can be ascertained from the appointed officers of each district. While restrictions are not, as a rule, severe, there is, however, a Government monopoly on the sale to the public of electric bulbs, which are subject to a tax of 25 per cent., plus an overprice varying according to the power and quality of the bulb.

Switching Examinations.—We have received from Messrs. A. P. Lundberg & Sons, Pioneer Electrical Works, 477-489, Liverpool Road, Holloway, N. 7, copies of their latest preliminary, intermediate and advanced examination papers in electric light wiring and switching, as well as a pamphlet describing these tests. We are told that about 300 papers sent in for the last competition are at present being examined. Since the inception of the scheme in 1913 up to June, 1919, 871 preliminary, 439 intermediate, and 214 advanced certificates have been awarded to entrants. The award of money prizes, which was discontinued in 1916, has now been reinstituted, and besides increasing the number of these prizes, Messrs. Lundberg have doubled their value.

The Trade Position in Peru.—A report on the finance, industry, and trade of Peru at the close of the year 1919 has been issued by H.M. Stationery Office. It was prepared by the Commercial Secretary to the Legation at Lima. It contains, among other information, tabulated statistical material relating to the import and export trade from 1908 to 1918. There is a great demand for all British-manufactured articles. The country was denuded of supplies during the war. It is suggested that a valuable foundation for future trade could be established if it were possible for British manufacturers to devote a certain percentage of their output to export. "It is clear that if export trade is neglected, an opening is left for competitors to establish themselves at a very favourable moment." Competition in foreign products, very largely from the United States, and to a small and increasing extent from Japan, was very great during the war ; in fact, from 1913 to 1917 by far the greater part of the import business was in American products. The effect of this need not be permanent, and given maintenance of standard in production and methods, there is no reason why Great Britain should not again occupy the same trade position as before the war. "American goods are, generally speaking, lower in price than British, but the quality is also inferior. The market is, however, getting accustomed to American prices and quality, and unless British goods appear promptly, and on a closely competitive basis, a certain amount of trade may be permanently lost." The question of representation in the market depends largely upon the business. There are a number of strong and old-established British merchant houses having offices in Peru and in London, and a number of British and Peruvian commission agents. If inquired of, the Commercial Secretary at the Legation will be pleased to make suggestions on such matters. A considerable number of public works are under consideration by the Government, but nothing definite has been decided, and no tenders have been called for yet. If political conditions remain stable, and the country continues prosperous, it is thought that many of these schemes may be worth examination.

Book Notices.—*Who's Who in Engineering.* 1920-1921. Annual. Edited by J. E. Sears, C.B.E., M.A., A.M.I.C.E. London : Compendium Publishing Co. 25s. net.—This is a very creditable attempt to develop the "Who's Who" principle on practical lines, so as to cover the engineering profession. It is not pretended that the collection is complete ; that will become possible with later annual editions, and, as omissions are remedied, a shortening process may become essential, unless the work is to reach very bulky proportions. The "Personal and Professional" Section occupies about 240 pages ; others relate to engineering institutions and societies, centres of technical engineering training, trading and research associations, companies and firms in the engineering and allied trades, an index to manufactures, &c. To produce a complete guide to all these persons and organisations is an ambitious undertaking, and the work has great possibilities. The general get-up and appearance are very satisfactory.

"Magnetos Simply Explained." *The Model Engineer* Series No. 42. By F. H. Hutton. (67 pp.) London : Percival Marshall and Co. Price 9d. net.—This is described as "a practical guide to the construction, management and uses of the modern magneto," and, starting at the principles of the magneto, it deals successively with manufacture, correct usage, and the "Inductor" magneto. Special types, combinations, and accessories are then described in detail, and, finally, typical standard devices are dealt with. The photographic illustrations are good, and many diagrams of connections, &c., are included.

"Repairs to Boilers and Engines by Welding." (23 pp.) Manchester : The National Boiler and General Insurance Co. Price 1s. net.—The introduction to this volume presents notes on the several welding systems in present-day use. Various examples of boiler repairs follow, in which methods best suited to each particular type of weld are described. These examples include the building-up of flanged seams of flue tubes, repairing fractures in chimney tubes and cast-iron sectional boilers. Repairs to gas-engine cast-iron parts are also described.

"Inter-Imperial Communication Through Cable, Wireless, and Air." By Sir Charles Bright, F.R.S.E., &c. (15 pp.) London : Fleetway Press.—This is an abstract of a paper read before Section F of the British Association, on September 12th, 1919.

"Die Wirtschaftliche und Technische Bedeutung des Elektrischen Antriebes für die Textilindustrie," (55 pp.), 3s., and "Die Amerikanisierung Europas : Kritische Beobachtungen und Betrachtungen" (91 pp.) 2s., by Gustav W. Meyer. Bodenbach : Technischer Verlag.

"The M. & C. Apprentices' Magazine." Vol. IV, No. 14. (60 pp.) —The Summer Number of this magazine is up to its usual high standard. The articles are well written and illustrated, as well as being numerous.

"Twelfth Annual Report of the Hydro-Electric Power Commissioners of the Province of Ontario for the Year ended October 31st, 1919." Vol. I. (287 pp.) Toronto : A. T. Wilgress.

"Report on Hydro-Electric Railways to the Hydro-Electric Power Commission of Ontario." By W. S. Murray, Consulting Engineer, New York. (15 pp.) From the Commission.

"Installation News," New Series No. 4. July 1920. Birmingham : Simplex Conduits, Ltd.—The latest number of this interesting quarterly publication includes notes on the manufacture of conduit, on the "Plexaim" electric iron, and also a table of new cable standards.

Strike.—Simultaneously with a dispute affecting 4,000 building trade operatives employed by the Port of London Authority, some 500 electricians at the port were, last week, also on strike owing to the refusal of the Ship Repairers' Association to pay the district rate of 2s. 3d. an hour.

Annual Outings.—The employés of Messrs. Laurence, Scott & Co., Norwich, went for their annual outing last Saturday week. Dividing into four parties, they journeyed to Yarmouth by road and rail ; to London ; or by char-à-bancs to Lynn and Hunstanton. A most enjoyable day was spent, and thanks were accorded to the firm for the generous financial support. The detail arrangements were excellently carried out by the various committees.

The employés of Messrs. Mann, Egerton's electrical department, Norwich, held their annual outing (the first since 1914) on Saturday last. The party trained to Wroxham, and boarded the motor launches *Osprey* and *Blossom*, at Messrs. Lloynes's quay, and enjoyed a pleasant trip to Acle Bridge Hotel, where luncheon was served. A few musical items were rendered, prior to leaving for "Ludham Dog" for tea. After Mr. Cowell had proposed a vote of thanks to those responsible for the arrangements, and some further musical items, the journey to Wroxham was resumed.

On Saturday last the staff and employés of Messrs. Burdette and Co., Ltd., of Blackfriars, went for their annual outing by char-à-bancs to Brighton. Luncheon was served at "Ye Olde Barne."

Patent Office Report.—Last year the number of applications was 32,853, the largest on record ; complete specifications filed numbered 18,922. Applications from abroad numbered 1,320, and under the International Convention, 2,661 applications were made.

E.P.D.—In the House of Commons on Monday, Mr. G. Terrell moved the reduction of the Excess Profits Duty from 60 per cent. to 40 per cent., but the motion was defeated by 289 votes to 117, majority 172.

Dissolution of Partnership.—Allen & Parkes, manufacturing electricians, 15, Summer Row, Birmingham.—Messrs. A. J. Allen & B. J. Parkes have dissolved partnership.

Trade Announcements.—Messrs. Docker Bros., Ltd., have removed their offices and warehouse to 4 and 6, Moor Lane, Moorgate Street, E.C. 2.

With reference to the "Business Notice" in our issue of July 2nd, entitled "Shut Down," we are informed that a new company has been formed, and is being registered under the title of Todman, Ryall & Co., Ltd., of 17, Victoria Street, S.W. 1, for the purpose of purchasing the designs, jigs, tools, gauges, and goodwill of the dynamos and motors previously manufactured by Messrs. Arthur Lyon & Wrench, Ltd., at Willesden Junction, and it has been arranged that production will continue without a break.

The Tudor Accumulator Co., Ltd., are removing their offices as from July 19th, to 2, Norfolk Street, Strand, W.C. 2.

Mr. T. H. Day, who was representative of the Edison Swan Electric Co. for about 13 years, is shortly joining the Newcastle branch of Messrs. Albert Lee & Co., Ltd., of 8-9, New Zealand Avenue, London, E.C., as representative.

Messrs. Newton & Wright, Ltd., announce that their business is now carried on at their works address, 471-477, Hornsey Road, N. 19, which has become the head office. An arrangement has been concluded with Messrs. Allen and Hanburys, Ltd., by which they become selling agents in the London area for Messrs. Newton & Wright, Ltd., and also in certain parts of the United Kingdom. Messrs. Allen & Hanburys, Ltd., are taking over the electro-medical showroom and staff at 72, Wigmore Street, W., until recently occupied by Messrs. Newton & Wright, Ltd., but Messrs. Newton & Wright, Ltd., will also have free access to the showrooms, and one of their directors will attend there by appointment.

Messrs. Wilson-Wolf Engineering Co., Ltd., of Bradford, have appointed Messrs. Pooley & Austin, of 34, Broadway, Westminster, S.W. 1, as their sole agents for London and district, and Mr. L. R. Erlynne is no longer their representative. The company have completed the reorganisation of their works, and are concentrating on the mass production of fractional H.P. motors of their new 1920 ball-bearing patterns ($\frac{1}{12}$ to $\frac{1}{2}$ H.P.), leaflets relating to which have been received.

Cancellation of Orders.—The following notice appears in the *Bulletin* of the Federation of British Industries for the current week :—

Cancellation of Orders.

The Federation has received complaints from various trades of the cancellation of orders for goods by both home and overseas buyers.

In order to gauge the extent of the evil, and to consider what steps should be taken to remedy it, it is necessary that the fullest information should be in our possession.

Those of our members who have had orders cancelled are requested to write to the General Secretary of the Federation, giving all relevant facts.

Company Liquidations.—Norman Johnson & Co., Ltd., Enfield, electric lamp manufacturers. — The creditors interested herein were called together recently at the offices of Messrs. Greenhalgh Sharp & Co., I.A., 16, King Street, Cheapside, E.C., when it was reported that the shareholders had passed resolutions for voluntary liquidation, and had appointed Mr. J. K. Garioch to act as liquidator. Mr. Garioch submitted a statement of affairs which showed ranking liabilities of £865, with net assets of £1,281. The issued share capital of the company was £3,300, and as regarded the contributories there was a deficiency of £2,884, although there was a substantial surplus so far as the creditors were concerned. The company was registered in August, 1919, with a nominal capital of £5,000, and took over the business previously carried on at Baker Street, Enfield, by Messrs. N. Johnson and E. J. Hawkins, under the style of N. Johnson & Co. The purchase price was fixed at £2,000, which was discharged by the issue to the vendors of fully-paid shares. The vendors were appointed joint managing directors at a salary of £6 per week. Mr. N. Johnson resigned his position as a director last September, and Mr. O. C. Gardner was appointed to a seat on the board in February last. The latter had received 800 shares which were subscribed for in cash, while 500 shares were allotted to Mr. Hawkins for cash. Trading and profit and loss accounts prepared as at December 31st last had disclosed a loss on the trading of £187. Since that date there was a further loss of £364, while nearly £600 had been expended on experimental work. After a short discussion, a resolution was passed confirming the voluntary liquidation of the company, with Mr. Garioch as sole liquidator, and an advisory committee of the creditors was also appointed. The following are creditors :—

Newsome & Son, Ltd., W.	£63	Davis & Timmins, Ltd.	£19
West & Sons, Ltd., J.	60	National Metropolitan Electric Power District Co.	20
Walsall Electrical Co.	52	Siemens Bros. Dynamo Works	18
Pearce, Wm., and E. Cutler, Ltd.	47	Warden & Co., A.	18
Senior & Co., T. W.	47	Young, Ltd., T. W.	20
Reflecto Metal Co., Ltd.	32	Engineers Universal Supply	16
The Efandem Co., Ltd.	28	The Bright Co.	13
Farmer & Co.	80	Holdway & Co., E. W.	12
Adams, Geo.	27	Toms, P.	14
Sturla & Sons, H. C.	24		
Delta Metal Co., Ltd.	23		

J. Hopkinson & Co., Ltd.—Winding up voluntarily for purposes of reconstruction. Creditors should send the usual particulars to the liquidator, Mr. C. E. Hobson, Britannia Works, Huddersfield, by July 31st. Meeting, August 26th.

Rotherham Council and the E.T.U.—The action of the Electrical Trades Union was strongly criticised at a meeting of the Rotherham Town Council on Wednesday last week. The Electric Light Committee reported the receipt of a letter from the Union on the question of electrical work installed by men who had apparently not the qualifications of an electrician, stating that cable jointers would refuse to connect up the service to any installation installed by cheap non-Union labour, or installed by plumbers. The Committee recommended that a deputation from the Union be asked to attend before it to discuss the matter.

Councillor Green, who commenced a discussion on the communication, moved as an amendment that the following words be added to the recommendation :—"And that they be informed that the Corporation would not permit the Electrical Trades Union or any other Union to decide what installations shall or shall not be connected with the electrical service." He (Mr. Green) said the attitude of the Union was most surprising. He suggested that action of this sort was in the nature of the Soviet system, also that the members of the Electrical Trades Union should themselves pass an examination before they were employed. The Corporation had a system of registration for plumbers, and he thought it might be advisable to apply a similar principle to the electricians. The Mayor (Councillor W. G. Bingham) did not think it was necessary to move an amendment. The feeling of the Committee was that they had nothing to do with the question of who wired private houses, as that was work that was undertaken by tradespeople.

After further discussion, the Mayor again asked Councillor Green to withdraw his admendment, which he agreed to do; the recommendation of the Committee was then adopted.

Catalogues and Lists.—Messrs. David Shanks & Co., Ltd., Denmark Street, Birmingham.—A profusely illustrated and fully priced catalogue of electric light fittings (98 pp.), dealing with pendants, brackets, standards, ships' fittings, lanterns, arc lamps, signs, &c.

Messrs. Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83, 85 and 87, Farringdon Road, E.C. 1.—Catalogue Edition No. 444. A handsomely produced list of electric light fittings. The list, which is fully illustrated and priced, covers a wide field, and includes brackets, shades, Louis Quatorze period designs, statuettes, &c.

The Newman Electrical Co., 64, Newman Street, W. 1.—Leaflet dealing with "Nuco" artistic fittings for semi-indirect lighting. Priced and illustrated.

British Insulated and Helsby Cables, Ltd., Prescot and Helsby, Lancs.—An illustrated list (12 pp.) of accessories for use in connection with the "Prescot" wiring system, including wire, joint-boxes, sealing ends, &c. Fully priced. List No. P 162, a priced catalogue of aluminium, copper, lead, tin, and special "Prescot" alloy fuse wires for currents ranging from 5 to 300 amperes.

Messrs. Downes & Davies, 1 and 3, Stanley Street, Liverpool.—An eight-page list of "Xcel" domestic electrical appliances, including kettles, cookers, suction cleaners, &c. Well illustrated and fully priced.

Messrs. Thomas Broadbent & Sons, Ltd., Central Ironworks, Huddersfield.—Photographically-illustrated leaflet, showing applications of an automatic centrifugal clutch for machines requiring a large starting torque with minimum current consumption.

Messrs. Thompson & Co. (agents for the Société Genevoise d'Instruments de Physique), 48, Watling Street, E.C. 4.—Prospectus No. 281, dealing with "Rex" single-phase A.C. meters. Illustrated and priced.

The Electrical Apparatus Co., Ltd., Vauxhall Works, South Lambeth Road, S.W. 8.—Leaflet B. 220. An illustrated description of D.C. control panels for 100-250-volt motors up to 5 H.P. for marine use, with prices.

The Macintosh Cable Co., Ltd., 22 and 23, Jewin Street, E.C. 1.—Catalogue Section 1 (35 pp.). A fully-priced list of rubber cables, flexibles and bell wires. Catalogue Section 4 (176 pp.) illustrating and describing feeder pillars, joint boxes and jointing accessories. Both lists consist of separate detachable sheets or leaflets.

Medal Award.—The Arora Co., Loughborough, informs us that the Arora apparatus, at the first exhibition at which it has been exhibited, has secured the highest medal award given for that class—namely, electric fires and cooking apparatus. The company's agents for Holland—Messrs. De Goede & Huf, of Amsterdam—state that Arora apparatus obtained the silver medal at the International Exhibition at the Paleis voor Volksvlyt, which was the highest award, as the gold medal was destined for other articles.

Bankruptcy Proceedings.—Ivor James Hodson and Basil Howard Newman (trading as Hodson & Newman), electrical engineers, 85, Queen Street, Exeter.—The public examination of these debtors was held on July 8th, at the Castle, Exeter. According to the debtors' statement of affairs the liabilities amounted to £745, and assets amounted to £225, thus disclosing a deficiency of £520. The examination was adjourned.

Annual Holidays.—The works and offices of Messrs. Higgs Bros., Birmingham, will be closed from July 30th to August 9th for the annual holidays, and correspondence will not be attended to during that period.

The works of Bromell Patents Co., Ltd., Glasgow, are closed from yesterday until Wednesday, 28th inst., and the offices until Tuesday, 20th inst., for the Fair Holidays.

Electricity to the Rescue.—The gas strike broke out in Manchester on Friday. In the afternoon of that day Messrs. Simplex Conduits, Ltd., had a motor lorry loaded up with first aid, in the way of electric kettles, and on the road to the stricken city. By Saturday morning, Plexaim kettles were finding a ready sale among Mancunians, some of whom are now learning for the first time that, for many purposes, gas is a back number.

LIGHTING AND POWER NOTES.

Accrington.—EXTENSION ABANDONED.—The Corporation states that it cannot see its way to supply electricity for lighting to the neighbouring town of Huncoat, having regard to the capital cost involved and the small revenue to be obtained.

Argentina.—COMPANY REPORT.—Some interesting figures are given in the annual report of the Société d'Electricité de Rosario, the headquarters of which company are in Brussels. The total receipts last year showed an increase not only over those of 1918, but, as contrasted with 1915, the advance is no less than 50 per cent. In connection with the supply of electricity to private houses, which is now 80 per cent. greater than in 1915, the report refers to the rapid way in which domestic electrical appliances, notably electric irons, are being adopted, these being now used even in the most modest households. The consumption of energy by business houses increased by 272,000 KW.-hours during last year, and even greater progress is expected during the current 12 months. The energy supplied for power purposes went up to the extent of 33 per cent., while the quantity supplied to the Compagnie Générale des Tramways de Rosario advanced from 5,100,000 to 5,435,000 KW.-hours. Altogether, the company is now giving a supply to 21,630 clients, as against only 1,284 in 1915. Although the receipts show a large increase, the working expenses have also been much heavier. Owing to the great difficulty experienced with regard to the supply of coal, during the year 33,621 tons of wood, 11,124 tons of bran and other miscellaneous material, and 7,603 tons of petroleum were purchased. The total production of the generating station of the company during last year amounted to 29,812,600 KW.-hours, an increase of 2,818,200 KW.-hours, or approximately 10 per cent. over 1918.

Batley.—YEAR'S WORKING.—The loss on the electricity undertaking for the past year was £300, as against £2,000 for the previous period.

Canada.—*The Times* states that the dispute between the Ontario Hydro-Electric Power Commission and the men engaged on the Chippawa Canal has been settled.

Cannock.—BULK SUPPLY.—The Electricity Committee of the Urban District Council has met a deputation from Wolverhampton Corporation, in connection with a supply of electricity. It is anticipated that Cannock will be able to obtain a supply of electricity in bulk from Wolverhampton, and that arrangements may be made to sell this at the same rates as obtain in Wolverhampton.

Chippenham.—PUBLIC LIGHTING.—The Town Council has accepted the tender of the Electric Supply Co. for public lighting at 6½d. per unit, plus an annual charge for maintenance of lamps.

Chirk.—ELECTRIC LIGHTING SCHEME ABANDONED.—The Urban District Council has decided to proceed with negotiations for the purchase of the local gas works at a suggested cost of £1,640, instead of installing electric lighting.

Cleckheaton.—LOAN.—Borrowing powers for £9,000 for extensions of electricity works in the Moorend district are being applied for.

YEAR'S WORKING.—The electricity undertaking figures for the year ending March 31st last showed that whereas at the end of the period 1918-19 there was a deficit of £1,625, last year there was a net profit of £383. This represented a working profit; the sale of old plant, &c., had resulted in additional profits being made.

Continental.—NORWAY.—The average cost of harnessing water power in Norway is at present kr. 700 or $194 per KW. The expenditure thus amounts to $19.40 per KW.-year, and this price is calculated to cover amortisation, interest, &c. In some cases, where it is necessary to convey the current over a long distance, the cost may rise to $50 per KW.-year, but even this is cheap compared with prices in the U.S.A. From 1910 to 1918 the consumption of electricity for industrial purposes increased from 145,000 H.P. to 770,000 H.P., *i.e.*, at the rate of 80,000 H.P. per annum, or 430 per cent. in all. During the same period domestic requirements increased from 68,000 to 210,000 H.P., *i.e.*, by 210 per cent. At the lowest estimate, the Norwegian resources in water power amount to 7·5 mill. H.P., or 3,020 H.P. per 1,000 of the population, as against 1,050 H.P. in Sweden and 290 to 540 H.P. in the U.S.A., also per head. The total amount of water power actually harnessed in Norway at the present time is 1·25 mill. H.P., or 0·5 H.P. per head, while in Sweden, where the resources are approximately 6 mill. H.P., 1·10 mill. H.P. is harnessed, or 0·2 H.P. per head. The corresponding figures for the Pacific Coast States, *i.e.*, Washington, Oregon and California, are 0·19 per head of the total population of 5 mill., the amount of water power harnessed being 940,000 H.P.—*Economic Review.*

AUSTRIA.—Employés of the Viennese municipal electric power stations have come out on strike owing to their demands for an increase in wages not having been met.—*Times.*

Carnforth.—PUBLIC LIGHTING.—The Town Council has decided to approach the Thrislington Colliery Co. with a view to securing a supply of electricity for public lighting.

Darlington.—TRANSFORMER PLANT.—The Town Clerk has been instructed to make application for sanction to borrow £5,000 for transformers for the electricity works.

c REDUCTION CANCELLED.—It was announced at a recent Corporation meeting, that the 10 per cent. reduction in power charges would have to be withdrawn on account of the increased cost of fuel and labour. The ½d. per unit rebate on lighting is to stand. The charge for lighting energy is still only 4d. per unit, as against 3½d. before the war.

Douglas (Isle of Man).—ELECTRIC LIGHTING.—Electric light orders have been applied for by the Electric Light and Power Co., Ltd., and the Corporation. The scheme of the former is estimated to cost £100,883, and a maximum charge of 1s. per unit is proposed.

Dover.—DOMESTIC APPARATUS.—As an experiment, the Town Council has sanctioned the expenditure of £100 for the purchase of electric cookers, to be let out on hire at a rental of 9s. per quarter.

Dunblane.—ELECTRICITY SUPPLY.—A limited company is being formed locally to supply the district with electric light and power.

Eastbourne.—ADDITIONAL LOAN.—The Town Council is applying for sanction to borrow £680, in addition to the £14,434 already applied for, to meet the increased costs of labour and material.

Edinburgh.—SWITCHGEAR.—The Electric Lighting Committee recommends the acceptance of estimates amounting to £68,000 for switchgear for the large new power station now under construction at Portobello.

Glasgow.—ELECTRICITY (SUPPLY) BILL.—The town clerk in a report to the Corporation, points out that the compulsory purchase of the electricity undertaking provided for in the new Electricity (Supply) Bill, would affect the city adversely, and recommends that:—"In these circumstances, the Corporation respectfully submits that the Bill should not be passed into law. It appears that the powers conferred on the Commissioners by the Electricity (Supply) Act, 1919, above referred to, to promote, regulate, and supervise the supply of electricity, are sufficient for the purpose of effecting any needed improvements, and, in any event, it submits that it is premature to proceed with the present Bill until the electricity districts have been determined, and an opportunity has been afforded for the submission of schemes, and for the ascertainment of the further powers, if any, that may be required."

High Wycombe.—OPPOSITION TO APPLICATION.—The Town Council has decided to oppose the application of the Electric Light Co. for permission to increase the maximum price of energy to 1s. 2d. per unit from 9d., on the grounds that the company is over capitalised, and that part of the plant is obsolete and prevents the economical generation of electricity.

Ilkley.—EXTENSIONS.—The District Council decided, last week, to purchase a Garratt engine and dynamo, estimated to cost £6 000, at Hackney Wick, provided that the Electricity Commissioners approve the extensions to the works and sanction the borrowing of the money. Instructions were also given to the surveyor, in conjunction with the electrical engineer, to prepare a scheme for the extension of the present electricity works in Little Lane.

Kirkcaldy.—YEAR'S WORKING.—The statement of accounts for the year ended May 15th last shows an income of £32,221, compared with £23,007 for 1918-19. The working expenses amounted to £25,223, as against £18,146, leaving a gross profit of £6,998 (£4,861). Payment of interest on loans, &c., left a net balance of £830, compared with £170 for the previous period.

Maidstone.—DOMESTIC APPARATUS.—The Town Council has received sanction to a loan of £1,000 for electrical apparatus, to be let out on hire.

Manchester.—YEAR'S WORKING.—The annual report on the electricity undertaking for the year ended March 31st last, shows a total income of £1,197,199, as against £906,529 for 1918-19. The total of working expenses was £765,357, compared with £640,704, leaving a gross profit of [£431,842 (£265,825) distributed as follows:—Depreciation, £211,232; loan interest, £93,262; income tax, £39,714; rate relief, £68,207; and the remainder, £13,605, cancelled last year's deficit.

Newcastle (Staffs.).—YEAR'S WORKING.—The annual report of the electricity undertaking for the year ended March 31st last, states that the sale of energy amounted to £6,285, an increase of £2,491, as compared with the previous year. The gross profit on revenue account was £2,207, against £1,383 last year. After payment of loan charges and other items, there remained a profit of £414, as against a loss of £286 in the previous year.

New Zealand.—SOUTH ISLAND.—H.M. Trade Commissioner (Mr. R. W. Dalton), in a recent letter, refers to the hydro-electric scheme which it is proposed to carry out in the Southland district of the South Island of New Zealand. As indicating to some extent the nature of the scheme, it is mentioned that the power is to be generated on Lake Monowai, and will be conducted to the boundaries of each of the towns in the area. It is the intention to supply the consumers direct in the country districts, while the boroughs and towns will have two alternatives—(*a*) the respective Borough Council or Town Board may purchase the power in bulk

and distribute the supply within its own boundaries; (*b*) the respective Borough Council or Town Board may permit the Power Board to distribute the energy within its boundaries, just as it proposes to do in the country districts. It is stated that within the area proposed to be covered by the scheme there are some 4,000 farms, to each of which power will be supplied. A poll of the inhabitants was recently taken on the question of raising £1,500,000 by loan for the purpose of carrying out the scheme, which resulted in an overwhelming majority in favour of the proposal. It is understood that an endeavour will be made to negotiate the loan in question in the United Kingdom, one of the conditions being that the machinery required will be purchased in this country.

Thames Valley.—A majority of ratepayers in the Thames Valley and Hauraki Plains districts has decided in favour of borrowing the sum of £2,000 for hydro-electric development.

Richmond (Yorks).—Scheme Deferred.—The proposed electricity scheme has been deferred for 12 months.

Sabden.—Water Power.—It has been suggested to the Burnley Rural District Council by the Sabden Parish Council that the latter's area could be economically lighted by electricity produced by water power. The cost of gas in the neighbourhood is very high, standing at 6s. per 1,000 cb. ft.

Sheffield.—Electricity Charges.—A deputation of representatives of local trade associations explained to the Electricity Committee the reasons against charging for power and lighting at equal rates. It was pointed out that the lighting load factor was only about 6 per cent. compared with 40 per cent. for power. In reply to so-called "analogies" in the prices charged for other commodities, it was emphasised that electricity was generated and used at the same moment. The legal right of the Corporation to make this drastic alteration was queried, as contracts had been entered into over various terms of years.

South Africa.—Cape Town.—The Corporation has received two new Babcock & Wilcox water-tube boilers, and these are being erected by Messrs. Reunert & Lenz. A 1,000-kw. Peebles converter is due to arrive, and a little later a 3,000-kw. generator. The Corporation is also calling for tenders for a 7,500-kw. alternator and condensing plant to the specification of Messrs. Merz & McLellan.

Southport.—Contractors' Protest.—The Southport and District Electrical Contractors' Association has lodged a protest against the Corporation running an electrical showroom in competition with the business of the members of the Association. In this connection it is interesting to note that at the meeting of the Southport Town Council, on July 6th, a resolution by the Electricity Committee was endorsed, instructing the electrical engineer to present to the next meeting of the Committee a statement showing the income and expenditure in connection with the showroom for the past 12 months, setting out the amount of discount allowed to contractors, and to whom such discounts have been paid. The engineer has also been instructed to present a statement to the next meeting of the Committee, showing the number of wiring contracts at present in force, the amounts outstanding, and the dates when the persons owing such outstanding amounts were last pressed for payment.

Stafford.—Extensions.—At a recent meeting of the Town Council, the Electricity Committee presented a report on the extensions now being carried out at the electricity works. The estimated cost of new plant, &c., was £56,150 15s., and £147,000 was estimated as the cost of buildings, foundations, &c. With £7,085 for contingencies the total estimated expenditure was £77,935 15s. The Committee's report was adopted.

St. Helens.—Loan Sanctioned.—The Town Council has received sanction to a loan of £2,958 for extensions to the electricity works and £22,000 for sub-stations, mains, rotary converter, transformers, and switchgear.

Torquay.—Electricity Supply.—The Town Council recently received a report of the conference in London regarding the Devon Electricity Supply Scheme. The Commissioners would not sanction any sub-division of the county for electrical administration. The Council, however, was of opinion that the four centres previously suggested would be the better. A conference will be held in Exeter later on the subject.

Warrington.—Extensions Deferred.—Pending further consideration of the whole matter by the Electricity Commissioners, the extension of the Warrington electricity undertaking has been deferred.

Wolverhampton.—Mains Extensions.—The Council is applying to the Electricity Commissioners for sanction to borrow £30,000 for defraying prospective expenditure to be incurred in connection with the laying of electric mains, made up as follows:—General mains work, £20,000; and transformers and sub-station equipment, £10,000.

The Electricity Committee has decided to purchase a 500-kw. direct-current turbo set from Mr. F. Gilman, of Birmingham, for the sum of £1,750.

Worcester.—At a meeting of the City Council, last week, the Electricity Committee reported a letter from the National Joint Board of Employers and Staff Members, urging that all undertakings should accept the findings of the Joint Board on all questions affecting staff members. The Committee resolved not to accept the findings of the Board, but to recommend the Council to grant the following increases of salary, to date from July 1st:—Mr. K. Smith, chief assistant, from £380 to £430; Mr. H. P. Waterhouse, mains superintendent, from £264 to £300; Mr. P. J. Addyman, station superintendent, £264 to £300; Mr. E. H. Hounslow, meter assistant, £222 to £230; and Mr. A. W. Powell, shift engineer, £234 to £250, &c. The High Sheriff pointed out that the recommendation was brought to the Council in consequence of a communication received from the National Joint Board of Employers and Staff Members, submitting a scale founded upon the plant capacity, and not upon the output generated. The plant capacity was 4,650 kw., and the present output was 2,000 kw. Having regard to the disparity between those two figures, the Committee felt that it was not justified in recommending the Council to adopt the scale. The recommendations were approved.

TRAMWAY AND RAILWAY NOTES.

Australia.—New South Wales.—The Railway Commissioners report the following statistics of the Government tramways for the quarter ended March 31st last:—Total income, £775,501, compared with £569,545 for the previous quarter; expenditure, £658,616, compared with £472,756. The total number of passengers carried increased by 18,069,313 to 84,845,634.

Bradford.—Renewals.—The Tramways Committee is recommending the Council to seek borrowing powers to the fullest extent possible for the renewals of the permanent way and rolling stock, which are considered to be imperatively necessary.

Continental.—Belgium.—The tramway service is at a standstill in the Charleroi basin, and the hauling at the coal mines is threatened. Several municipalities are without light, and the railway stations and wholesale bakeries are deprived of current.—*Economic Review.*

The report of the central section in the Belgian Railway Budget gives some interesting notes on the proposed electrification of the Belgian State Railways.

The scheme is to be carried out in three stages. The first stage will embrace the whole of the lines and stations connecting Brussels and Antwerp; the second, the Luxemburg and branch lines, including particularly the Marloie—Angleur—Kinkempois—Liége—Ans line and the quadrilateral Marbehan—Lamorteau—Athus—Autelbas; the third, sections of the different lines radiating from Brussels; Brussels (Nord)—Ghent (St. Pierre) and Ghent (Sud), Brussels (Nord)—Louvain, Brussels (Nord)—Terveuren, Brussels (Midi)—Charleroi, Brussels (Midi)—Braine le Comte and the Hal—Enghien branch line, the Ouest de Bruxelles Circle. On the Brussels—Antwerp line it is first proposed to run 38 trains a day of a carrying capacity of 550, for travellers only; this will involve the electrification of 87·3 km. of main and 15·3 km. of secondary line, but when the entire first stage is completed 54 trains will be run in each direction at intervals of 20 minutes. The whole distance will be covered in 32 minutes, at an average speed of 83 kilometres per hour and at a maximum speed of 90 km. per hour. Goods trains will be run at a speed varying from 17 to 45 km. per hour. On the Luxemburg line the passenger trains will be run at an average speed of 70 km. per hour, and at a maximum one of 90 km.; the goods trains at 40 km. and 45 km. respectively. On the basis of calculations made for the Brussels—Antwerp line, a saving of 25 per cent. in the coal consumption is anticipated.—*Economic Review.*

Darlington.—Extension.—At a meeting of the Town Council on July 8th it was decided to carry out an extension of the tramway system from the Market Place to Feethams and Bank Top Railway Station at an estimated cost of £15,000.

Doncaster.—Loan.—Borrowing powers are to be sought for £14,070 for the laying of a double track of tramway from Cleveland Street to a point opposite the Balby Laundry, plus the cost of widening Balby Bridge and overhead equipment. A plan is also being prepared for the widening of Carr House Lane with a view to an extension of the tramway system along this route.

Halifax.—Parliamentary Bill.—By the passing of the Corporation Bill, powers are conferred upon the municipality to widen the tramway gauge to conform with that of neighbouring towns; permission is given to carry goods on the cars; a five years' extension of time is given for many orders which were near lapsing; and permission to increase the fares to a maximum.

Kirkcaldy.—Year's Working.—The total income from the tramways for the year ended May 15th, 1920, was £35,635, as against £28,060 for the previous period. Working expenses amounted to £25,949 (£19,695), leaving a gross balance of £9,686 (£8,365). The net profit after payment of loan charges, &c., was £3,720, as against £3,447 for 1918-19.

Lancaster.—Discussion on Report.—The Corporation held a special meeting, on the 8th inst., to discuss the report of the expert (Mr. Fearnley, of Sheffield), and the chairman of the Tramway Committee (Councillor Wilkinson) indicated the possibility of effecting economies to the extent of £300 per annum. By converting a number of double-deckers into single-deck cars of the "pay-as-you-enter" type there will be a saving of

£25 per week in wages, £90 a year in tickets, £280 in repairs and maintenance. Mr. Patterson (the new tramway engineer) has instituted other economies which will save £550. By 19 votes to 7 the report of the expert was adopted in principle, and the Castle Station line closed.

Manchester.—YEAR'S WORKING.—The report on the past year's working of the tramway department gives the following results; last year's figures are shown in parentheses:—Total revenue, £1,586,863 (£1,369,609); total working expenses, £1,207,231 (£969,391); gross profit, £379,632 (£400,218); bank interest, £18,862 (£17,861); loan charges, &c., £170,658 (£167,653), leaving a net profit of £227,837 (£250,428), which has been distributed as follows: Renewals fund, £80,229; income tax, £35,717; and contribution in aid of rates, £111,891. The number of passengers carried increased by 31,106,711 to 285,046,914. The average fare paid increased from 1·294 to 1·342d. per passenger.

West Bromwich.—INEQUITABLE CONTRACT.—At a Council meeting on July 8th, at which the annual report of the electricity undertaking was presented, it was stated that the question of supplying power for the tramways was becoming more serious, because the tramway company had a contract which acted unfairly. It paid 1d. per unit, which represented a considerable loss, while much of the power was supplied outside the borough. That meant that the company, with a favourable agreement, was running its cars outside the town on energy for which it paid the Council less than half the cost of generating it. The Committee had endeavoured to get some alteration in the terms, but was unable to do so until the termination of the contract.

West Ham.—WAGES.—Claiming that their wages compare unfavourably with the rates being paid in Croydon, Ilford and Leyton, the employés of the Tramways Department are asking for a minimum rate of £2 7s. 6d., rising in one year to £2 10s. plus a war bonus of £1 14s.

Wolverhampton.—YEAR'S WORKING.—The total income of the Corporation tramways for the year ended March 31st last was £111,663. Against this was a total of working expenses amounting to £89,835, leaving a gross profit of £21,828; there was also a gross profit from the motor omnibus service of £376. After payment of taxes, loan charges, &c., the result was a balance of £13,330, transferred to the appropriation account.

Wrexham.—COMPANY'S PROTEST.—At a Council meeting the chairman and manager of the Wrexham District Electric Tramways entered a protest against the growing competition of motor vehicles owned by private individuals, and promised the Corporation another £500 a year in respect of additional power taken if such competition were stopped. Sir Leonard Rowland said he did not believe in prejudicing the enterprise of small owners for the benefit of a large combination. The matter is to be further considered at a special meeting.

York.—WORKING LOSSES.—It was reported at a recent City Council meeting that over £2,000 had been lost on the 'bus service in connection with the Tramways Department. The Council was also told that the tramway system was not paying its way, and some scheme would have to be devised for increasing the revenue or diminishing the service.

TELEGRAPH AND TELEPHONE NOTES.

Australia.—WIRELESS RESTRICTIONS MODIFIED.—The Federal Government has decided to modify, to some extent, the restrictions placed on the use of wireless telegraphy during the war. Subject to approval of the authorities, licences for the erection of wireless plant will be granted to Australian ships, to technical schools, and similar institutions, and to persons who desire to make use of wireless for instructional purposes and scientific investigations.

TELEPHONE INSTALLATION DELAYS.—It is stated that in Sydney alone there are now about 5,000 unsatisfied applications for telephone installations. The trouble is caused by a lack of materials, instruments, exchange equipment and such like, and the department has been expected to meet the ever-growing needs of a complex service without a sufficiency of capital. During the last three years the minimum amounts asked for by the P.M.G. totalled £3,032,000, but he was only allowed £1,697,000, and owing to the late dates at which the amounts were made available each year the programme of works was so seriously interfered with that it was not possible to take advantage of the sums allotted so far as revenue items were concerned. These items consequently lapsed, although the commitment had to be carried forward until the following year, and be provided for out of the reduced sum allotted for that year. The last annual report of the department states that the delay and intermittent doling out of inadequate sums, apart from the systematic cutting down of the bedrock estimates of the department, is mainly responsible for the position existing to-day, which must be seriously accentuated in the immediate future.

China.—WIRELESS TELEGRAPHY.—The scheme of linking up Pekin with the most distant provinces of China by wireless should now be well in hand, according to latest information. The scheme embraces the erection of wireless stations at Urga and Kashgar, on the borders of inhospitable Turkestan (Chinese) with a third at Kobdo. A fourth station will be at Hami, in Mongolia, and it is the intention of the Chinese Government to have the Nami and the Kobdo stations and a fifth one in Sian-fu, Stensi, Mongolia, working before the Urga and Kashgar stations are completed.

Japan.—TELEPHONE "BROKERS."—The Kobe correspondent of the *Chamber of Commerce Journal* writes as follows under date May 13th:—"Methods of trade here are too advanced. In England it is still very largely the rule for a man to trade with his own capital. In Japan, never. Every conceivable trade and industry is carried on with advances from the bank and every conceivable commodity has its broker. For instance, there are in Kobe numbers of telephone brokers. There is a great demand for telephones in Japan. The supply of them is a Government monopoly, and the average time between application and installation is 10 years. When anybody gives up his telephone he can transfer it to somebody else. This is where the telephone broker comes in, and he knows the pulse of the market so well that, whereas before the war it was easy to get a telephone for £100, it is no uncommon thing to pay £300 now. The telephone is, indeed, an important gauge of business prosperity. When the slump came last month telephones dropped sharply, probably in anticipation of many businesses closing up; but the fall has not continued, so apparently there is confidence in business continuing to exist, even dully. The prices which have declined were purely artificial, and it is possible that the slump will do a great deal of good. It would be a good thing if it only diminished the number of brokers and reduced things to something like their real value."

Photographs by Wireless.—The *Daily Mail* and the *Daily Mirror*, of London, are contemplating the inauguration of a service by which photographs for publication will be transmitted by means of wireless telegraphy. Ten years ago Mr. T. Thorne Baker sent pictures by means of the telegraph wire from Paris and Manchester to London. Recently a Danish engineer announced the perfecting of a similar method.

New Zealand.—LONG-DISTANCE TELEPHONE.—The Engineer-in-Chief to the Telegraph Department is coming to London shortly, and part of his business will be to make final arrangements for the purchase of a submarine cable and apparatus to connect the North and South Islands by telephone. The cable will weigh some 15 tons per nautical mile, and the cost will not be less than £1,000 per mile. As the distance is about 60 miles, the total capital cost, including the apparatus and the cost of laying the cable, will easily absorb £100,000.

Telephone Rates.—INCREASED COSTS.—Giving evidence before the House of Commons Committee on Telephone Charges, on July 7th, the Assistant Engineer-in-Chief to the Post Office said that the cost of labour and material for the construction of underground lines had gone up 236 per cent. The over-all increase for plant installed had gone up 204 per cent. The figure representing the cost of administration and operating expenses had gone up from £1,500,000 in 1913-14 to £4,710,000 in 1920-21. The increase was due partly to the normal developments of the system and partly to the increased wages. The costs kept pretty well level as the system increased. There was a research school, and a small number of awards had been given for inventions by minor members of the staff. Plant was coming in very slowly. It was the policy to continue underground cabling wherever possible. It was more economical.—*Daily Telegraph.*

Wireless Telephony.—It is proposed to establish wireless telephonic communication between Newfoundland and England with the object of keeping the delegates to the Empire Press Conference, which is to be held at Ottawa in August, in touch with this country during their voyage across the Atlantic. One station is to be established in Cornwall, another at St. Johns, and a third on board the ss. *Victorian*, on which the delegates will sail.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW, *in which the "Official Notice" appeared.*

OPEN.

Australia.—SYDNEY.—August 4th. N.S.W. Government Railways and Tramways. Two 1,000-KW. sub-station units. Chief Electrical Engineer, 61, Hunter Street, Sydney.

BRISBANE.—August 28th. City Electric Light Co. High-tension switchgear. Secretary, Boundary Street, Brisbane.

MELBOURNE.—P.M.G.'s Department. August 17th. G.I. and steel stranded wire for all States (schedule 1,626).

August 24th. Copper jointing sleeves for all States (schedule 1,632).

August 31st. Porous cells and outer jars for all States (schedule 1,627); bronze wire for various States (schedule 1,629); covered and braided wire for all States (schedule 1,633).

Atherton.—July 20th. Urban District Council. 150 yds. ·022, L.T., concentric, paper-insulated, lead-covered and steel-armoured cable. (July 9th.)

Belgium.—August 7th. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply of a large quantity of miscellaneous telegraph material, including 5,400 metres of cable.

Blackpool.—August 27th. Corporation. Two water-tube boilers, superheaters, economisers, stokers, &c.; two induced draught plants; coal conveying, &c. plant. (See this issue.)

Brentford.—July 27th. Board of Guardians. Electric lighting installations in the offices, infirmary, &c. (July 2nd.)

Egypt.—August 15th. Electric lift in the Kasr-el-Aini Hospital, Cairo. A copy of the specification, in the French language, can be inspected at the Department of Overseas Trade in London (Mr. Sykes, Room 50; Victoria 9040, Ext. No. 2).

Grantown-on-Spey.—July 31st. Electric light work in connection with housing scheme. Specifications from Mr. H. J. Fraser, Burgh Surveyor, 25, High Street, Grantown-on-Spey.

Grimsby.—August 12th. Electricity Department. Two water-tube boilers, economisers, fittings, fans, chimneys, &c.; one 3,000-KW. high-pressure turbo-alternator and condensing plant. (July 2nd.)

Manchester. — August 6th. Electricity Committee. Water pipes and valves, &c., for Stuart Street. (See this issue.)

Nuneaton.—July 31st. Electricity Department. One 500-KW. rotary converter transformer and accessories. (July 2nd.)

Portsmouth.—July 20th. Tramways Committee. 1,000 tons steel girder tram rails; 20 tons steel fish plates; 5 tons fish bolts; 30 tons wrought-iron tie bars. (July 2nd.)

Spain.—The Spanish Post and Telegraph authorities in Madrid have just invited tenders for the supply of 47 tons of bronze wire, 3½ m/m diameter, required for use in connection with the Bilbao, Gibraltar and Madrid telephone lines.

Warrington.—August 10th. Electricity and Tramways Committee. Coal elevator and conveyor. (July 9th.)

CLOSED.

Belgium.—The municipal authorities of Slins recently invited tenders for the concession for the electric lighting of the little town, but not a single offer was received.

Bedford.—Education Committee. Accepted:—
Electric-light installation at Queen's Park Schools, with "Kalecco" wiring system.—Messrs. Gollings & Ayres.

Bradford.—Electricity Committee:—
Auxiliary piping for boilers.—Stewarts & Lloyds, Ltd.
50 chrome steel axles, £516.—Cammell, Laird & Co., Ltd.
200 steel tires for tramcar wheels, £1,666.—J. Brown & Co., Ltd.
6 tons c.i. brake shoes, £162.—National Rail & Tramway Appliances Co., Ltd.
Two electric lifts.—Waygood-Otis, Ltd.

Liverpool.—Corporation. Accepted:—
Babcock & Wilcox, Ltd.—Three water-tube boilers and accessories.
E. Green & Son, Ltd.—Three economisers and accessories.

Malvern.—Urban District Council:—
Electrical Apparatus Co.—Meters for a year.

Northampton.—Town Council:—
Four tramcars.—Dick, Kerr & Co., Ltd., £3,407 each.

Runcorn.—Urban District Council:—
Installation of street lighting by electricity, with standards and running stay wires.—Mersey Power Co., Ltd., £205.

Stretford.—Urban District Council. Accepted:—
Callender's Cable & Construction Co., Ltd.—Laying feeder cable between the power station and No. 2 sub station.—Met.-Vickers Electrical Co., Ltd. Air cooler for the new turbine set, at £1,625.

FORTHCOMING EVENT.

Batti-Wallahs' Luncheon.—Monday, July 19th. At the Holborn Restaurant. At 1 p.m. Grousers' gathering.

NOTES.

Appointments Vacant.—Northampton Institute wants an assistant lecturer and demonstrator in the Electrical Engineering and Applied Physics Department, at £225 to £315; the Newcastle-upon-Tyne Electric Supply Co. is inviting applications for the position of deputy charge engineer at Carville power station, at £354 per annum. The Mersey Docks and Harbour Board invites applications for the position of principal assistant to the engineer-in-chief. He must be a fully qualified civil engineer, with a good knowledge of mechanical and electrical engineering. Glamorgan Education Committee is inviting applications for two appointments as travelling lecturers in mechanical and electrical engineering, at £250, rising to £450.

Two assistant charge engineers, for Bristol Electricity Department; electrical engineer as assistant to chief engineer of the Madras Electric Supply Corporation; overhead linesman, for Burton-on-Trent; constructional draughtsman for the Doncaster Electricity Department (£350); cable jointer for Perth Electricity Works. See our advertisement pages to-day.

Service Notes.—A Royal Warrant has just been issued authorising the formation, pay, &c., of the Corps of Signals, which is to be formed out of existing signalling companies of the Royal Engineers. It is officially intimated that the Administrative services of the Army, including Corps of Signals and Telegraph Supplies, are to be actively employed in peace time, so as to be always ready for active service if required. It is also intimated, amongst other things, that field officers of the Royal Engineers who have held permanent, regular or temporary commissions in the Army, Special Reserve, or Territorial Force during the War, will be eligible for engineer pay in the Territorial Army. Officers appointed to the Territorial Force since September, 1919, outside the above category, will be eligible for engineer pay if qualified as A.M.I.C.E., A.M.I.M.E., or A.M.I.E.E., or equivalent professional qualifications. Lieut. H. S. Craig, London Electrical Engineers, has resigned his commission, and retains his rank. Lieut. J. R. Lang-Hyde, from the Tyne Electrical Engineers, has been appointed in the same rank to the Territorial Reserve of Officers.

A Gearless Lighting and Starting Set.—The Bowman-Ashden "fly-wheel dynamotor and magnetic clutch brake" is a new device which forms a gearless starting motor and charging dynamo, and at the same time acts as a "clutch brake" to facilitate gear changing. According to the *Practical Engineer*, a "Gramme" ring armature, combined with the outer member of the clutch, surrounds and overhangs a four-pole stationary field magnet system. The free clutch member can thus be set spinning with the gear in neutral and the clutch out, and the engine started up gently by letting the clutch in. Normally, the arrangement gives current as a lighting dynamo, and when the clutch is taken out with the car in motion, the torque between field and armature tends to slow down the spinning clutch member. A slightly more complicated double clutch system is also referred to.—*Technical Review.*

Board of Education.—The removal of the main offices of the Board of Education from the Victoria and Albert Museum to the premises formerly occupied by the Board in King Charles Street, Whitehall, commenced on July 12th, and will, it is hoped, be completed by the end of the month. On and after July 26th, the official address of the Board will be Whitehall, London, S.W. 1. Telephone number, Victoria 9800; telegraphic address, Aristides Parl, London.

Power from the Air.—A Hamburg scientist named Plouson, says the *Daily Express*, proposes to obtain a cheap supply of energy from the air by sending up metal balloons to collect electricity; he hopes to supply all Germany with electric power. No doubt he will use extra-high (pressure) overhead mains to enable the electricity to step down.

Hydro-Electric Power in Tasmania.—In our issue dated November 21st last there appeared a paragraph under the above heading, which in due course came to the notice of the chief engineer and general manager of the Tasmanian Hydro-electric Department, who has informed us that the information supplied was incorrect, and asks that it be corrected.

The actual position is as follows: A contract was entered into some years ago between the Hydro-electric Department of Tasmania and the Electrolytic Zinc Co. Up to 30,000 H.P. was to be supplied for the purpose of manufacturing electrolytic zinc from calcines imported all the way from Broken Hill, in New South Wales, via Port Pirie in South Australia, and the terms of that contract were subsequently modified, the present arrangements being as set out in the paragraph of the ELECTRICAL REVIEW referred to above. This contract was for a period of 20 years, with an option of renewal for another 20 years.

Long after this original contract was entered into, negotiations between the Government and the Mount Read and Rosebery Mines, Ltd., came to a head, but after reaching a more or less definite stage the negotiations were suspended at the request of the company, in order to enable it to consider thoroughly the question of the comparative economics of establishing its treatment works either on the West Coast of Tasmania, at the deep-water port of Hobart, or not to establish them at all, but to have its ores treated at the existing Electrolytic Zinc Co.'s works.

Throughout the whole of these negotiations the Government has never once asked a price approaching £4 10s. per H.P. per annum, and to state that the policy of the Government is directed to building up the Risdon works at the expense of another proposed works is erroneous.

A tentative contract has been arranged with the Mount Read & Rosebery Co. for the supply of 15,000 H.P. (as compared with 30,000 at Risdon) for a period of 15 years (as compared with 20 years at Risdon) at a price of £2 5s. per H.P. (as compared with £2 rising to £2 10s. under certain conditions at Risdon), to treat ores mined close to the works on the West Coast (as compared with treating concentrates which have been railed from Broken Hill to Port Pirie, including a change of gauge, roasted at Port Pirie, loaded into steamer, and transported to Hobart as with the Risdon Co.); in addition to this the costs of hydro-electric machinery have increased from 40 to 50 per cent. between the dates when these two contracts were entered into.

Electricity in Gold and Silver Mining.—Under this heading the *Journal of Electricity* gives an interesting account of the working of some Nevada mines. The data given are not confined to mining alone, but the larger power-consuming operations of milling are also dealt with.

The following table shows the actual power consumption of a typical property in Nevada, that of the Goldfield Consolidated Mines Co., at Goldfield. These figures represent practice at Goldfield for the years 1915-16-17, and correspond to a production of 1,000 tons of dry ore per day. Mining was carried on through vertical shafts with an average depth of 600 ft., with a moderate amount of water to be pumped, and the mill was the usual stamp mill with cyanide treatment.

The volume of production does not affect the power consumption per ton provided the plant and equipment are of proportionate size. For instance, at the Nevada-Packard mine, at Packard, Nevada, where the production is only 100 tons per day, the power consumption for all purposes has averaged only 30.9 KW.-hours per ton for three years, measured on the low-tension side of the transformers. This figure covers both milling and mining, but the only power used in mining in this case is that for compressed air, about 4.5 KW-hours per ton, since the mine is worked through a tunnel under the ore bodies and above the mill. At Aurora, Nevada, the power consumption for all purposes in the summer of 1916 was 43.4 KW.-hours per ton, of which the mill alone was responsible for 36.07 KW.-hours. Production at Aurora was 500 tons per day. Mining was done through a tunnel as at Packard, and hence the only power for mining was for compressed air, 5.1 KW.-hours per ton, and for the electric trolley railway in the tunnel, 0.93 KW.-hour per ton. The greater power consumption at Aurora in milling is accounted for by the fact that the ore was entirely of hard quartz, and came from the mine wet and sticky so that it would clog up in the crusher and conveyors.

	Motor capacity. H.P.	Maximum load. H.P.	All day average. H.P.	KW.-hr. per ton dry ore.
Mines:				
Light equivalent	—	15	10	.2
Compressed air	400	420	260	5.3
Pumps	280	210	93	2.0
Hoists	750	1000	88	1.8
Miscellaneous power	100	30	7	.2
Total Mines	1530	—	458	9.5
Mill:				
Crusher (gyratory)	150	50	10	.26
Conveyors to battery	60	40	12	.29
Stamp battery	250	240	212	4.26
Tube mills	400	480	448	9.20
Chilean mills	200	300	190	3.86
Concentrate tables	60	34	31	.63
Air compressors (for agitation chiefly)	250	250	240	4.9
Pumps	340	215	156	3.3
Miscellaneous power	270	100	50	1.2
Light and heat	—	80	40	.8
Total Mill	1980	—	1389	28.70
General Depts., light, heat, and power				1.4
Losses in line and transformers and in regulation				3.4
Grand total				43.0

Fire at Glasgow Technical College.—According to the *Times*, £14,000 damage was done at the Royal Technical College, Glasgow, on Saturday, by a fire in the chemical store.

The Cost of Printing and Scientific Proceedings.—Owing to the increased cost of printing, the Berlin Academy of Sciences is no longer able to publish its works.—*Times.*

INSTITUTION NOTES.

Diesel Engine Users' Association.—The Association at the June meeting discussed the proposed Research Association for Liquid Fuels. Mr. Napier Prentice, who is chairman of the Provisional Committee of the Research Association for Liquid Fuels, read a report which had been prepared by Mr. Percy Still, who is acting as hon. secretary of the Provisional Committee. This referred to the difficulties which had been experienced, and partly overcome during the war, in connection with the use of tar oil fuel in Diesel engines, and to the importance of obaining further information by systematic research with a view to the possibility of the more extended use of home-produced fuel in Diesel and semi-Diesel engines. It explained the steps which had been taken to obtain Government support for a suitable research association under the Government scheme of scientific and industrial research. It was also announced that the Committee's application for the loan from the Admiralty of certain Diesel and semi-Diesel types of engines to be used for the purpose of testing various classes of fuel oils had received favourable consideration.

Mr. A. Abbott, of the Department of Scientific and Industrial Research, addressed the meeting on the subject, and added that the Director of Fuel Research was of opinion that research work on the use of liquid fuels would be of great value, and would not lead to any overlapping of effort.

In the discussion that followed, Dr. W. R. Ormandy said that if the extended use of the internal-combustion engine was to be encouraged, it was desirable that such engines should be capable of running on the widest possible range of fuels, on oils that might be derived from any part of the world. It was also eminently desirable for national reasons that increasing quantities of creosote should be made available in this country as fuel for internal-combustion engines.

Mr. Geoffrey Porter referred to several problems which members of the Association had endeavoured to elucidate, in which research work would have been of the greatest service.

Mr. G. W. F. Horner, Captain N. E. Drury, Mr. H. A. D. Acland, and Mr. A. J. Wilson, also discussed various points raised in Mr. Abbott's address, and Mr. Abbott replied.

Institution of Civil Engineers.—On Tuesday, last week, the annual Conversazione of the Institution was held at the Institution, Westminster. A large number of members and guests were received by Sir John P. Griffith, president, and Miss Griffith, in the Great Hall. The decoration of the ceiling of the Hall has recently been completed, being a gift from the president to commemorate the part taken by the Institution in the Great War. The work was designed and executed by Mr. Charles Sims, R.A. The principal subject of the large painting in the centre of the ceiling is a flying figure of Renown, a mourning veil of purple about her. She holds out a wreath of bays with a gesture of crowning; on her left shoulder is the flag-pole of a Union Jack, which half drapes her and spreads over the sky, across which an aeroplane floats. Officers in the uniforms of the several services appear along the north side of the panel. The other edges show engineering constructions. The picture appears to be lighted from the windows of the hall, the best view being from that side; but there is a base contrived for each point of view. The various rooms of the Institution building, which were tastefully decorated, were thrown open to the guests, and refreshments were served on several floors. During the evening a string band of H.M. Royal Engineers, under the direction of Lieut. Neville Flux, F.R.A.M., and the Blue Imperial Band, conducted by Mr. A. H. Pitman, rendered musical selections, while the programme of the Ensemble Glee Singers was much appreciated. The museum contained a collection of specimens and photographs illustrating the deterioration of structures exposed to sea action, and an exhibition of engineering models and scientific apparatus was arranged on the ground floor. Out of the 71 exhibits displayed, some half-a-dozen were of electrical interest. These included a lighting dynamo for commercial vehicles shown by Mr. T. Blackwood Murray, D.Sc., and telephonic repeater apparatus making use of wireless valves by Messrs. R. M. Chamney, B.Sc., and C. Robinson, B.A. Mr. F. C. Lea, D.Sc., exhibited extensometers for testing concrete and metals at high temperatures, together with a small furnace for Brinell testing at high temperatures. The furnace was made to determine the effect of temperature on the hardness of alloys. Nichrome wire is wound round a steel tube, the wire being insulated from the tube by strips of uralite laid parallel to the axis. The whole is embedded in asbestos fluff and encased in another tube. Two holes allow of the insertion of thermo-couples. At the end of the furnace is a fixed block on which the specimen rests inside the furnace. A plunger, to which is attached a 10-mm. ball, enters the other end of the furnace, and the load is applied to this plunger. After the specimen is inserted, the whole is brought to a steady temperature while resting on the table of any suitable type of machine; the load is then applied. The Brinell number is measured in the ordinary way by determining the diameter of the impression when the specimen is cold. Corrections of this diameter for temperature can be applied if necessary. The Brinell number found in this way is a very useful indication of the suitability of alloys to withstand certain temperatures. By favour of Capt. H. Riall Sankey, C.B., C.B.E., Marconi's Wireless Telegraph Co., in addition to historical apparatus, exhibited and demonstrated a marine type direction finder with an aerial, a receiving set with a 3-ft. frame aerial, and an automatic "calling-up" device. This consists of a galvanometer so adjusted as to respond to a definite wireless signal. When, for instance, an S.O.S. signal is intercepted, the galvo needle commences to swing, its oscillations increasing until contact is made between the point of the needle and a piece of carbon. This completes a circuit which energises a relay, which in turn rings a bell.

Association of Consulting Engineers (Inc.).—The report of the committee for the year ended April 30th, 1920, states that owing to an increasing tendency to carry out works either by direct labour or on a prime cost and agreed profit basis, a sub-committee of the Association is engaged in drawing up a model set of conditions for use in the latter case. Negotiations are also in progress with the Federation of Civil Engineering Contractors with a view to arriving at an agreement with regard to an "over-riding" clause which the Federation desires shall be inserted in all public works contracts of a purely civil engineering nature.

The Association has also accepted the invitation of the Council of the Institution of Electrical Engineers to nominate a member on a committee to consider the revision of the Institution's model general conditions of contract for electrical work, and has appointed as its representative its hon. secretary, Mr. A. H. Dykes.

During the year the Association has been asked by the British Engineering Standards Committee to appoint representatives on each of its various sub-committees. In addition to the representatives set out in the last interim report, nine members have been appointed to represent the Association.

A sub-committee has been sitting during the year to consider clauses proposed by the British Electrical and Allied Manufacturers'

Association for insertion in contracts for steam turbines. The sub-committee, after securing the views of all members of the Association interested in the matter, prepared a report which was forwarded to the British Electrical and Allied Manufacturers' Association in February last, and is now being considered by its committee.

The Foreign Office and Board of Trade suggest that in all cases where members are visiting foreign countries and various parts of the Empire, they should furnish early notice of any such visits to the Department of Overseas Trade, 4, Queen Anne's Gate Buildings, so that the Department may notify His Majesty's Diplomatic, Consular and other officers abroad concerned, in order that they may have an opportunity of rendering assistance and of discussing matters connected with British trade of very great interest to them.

The passage through Parliament of the Electricity (Supply) Bill has naturally been followed with the closest attention by the electrical—indeed, by all—members of the Association, and it is hoped that it will inaugurate great developments in the engineering industry of the United Kingdom. The Association records with satisfaction that the Chief Electricity Commissioner appointed under the Act is Sir John Snell, who was a valued member of the Association.

The accounts for the year 1919-20 show a balance to the good of £25.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

The Torquay Town Council has increased the salary of the electrical engineer, Mr. WOODS, from £500 to £600 per annum as from mid-summer, and by further annual increments of £50.

Doncaster T.C. has appointed Mr. J. H. BRAMLEY, of Lincoln, as draughtsman at the electricity works at a salary of £325 a year.

Mr. T. G. RICHARDSON, manager of the Colne Corporation Light Railways, has been appointed general manager of the West Hartlepool Corporation tramway and omnibus undertaking. He has been engaged in tramway work for 20 years, the first 13 being spent with the Bradford city tramways, and the remaining period as general manager and engineer to the Colne Corporation Light Railways.

Mr. T. H. U. ALDRIDGE, engineer-in-chief and manager of the Shanghai electricity department, was to leave Shanghai in May on a visit to the United States and England.

Manchester Electricity Committee recently recommended the Council to enter into an agreement with Mr. S. L. PEARCE, C.B.E., M.Sc.Tech., in connection with the new Barton Power Station, and any future power station that the Corporation may be required to erect during his tenure of office, whereby he shall receive, in addition to his present salary, a remuneration at the rate of one per cent. on the contract amounts of the steam and electrical plant and machinery to be installed, the items on which such remuneration is payable to be scheduled to the agreement, and that this arrangement be conditional upon Mr. Pearce agreeing to remain in the service of the Manchester Corporation at his present salary (£2,000 per annum) until reaching the age of retirement under the proposals of the superannuation scheme.

When the matter came before the Council on Wednesday last week some discussion arose as a result of which the chairman of the Committee consented to take the recommendation back with a view to seeing whether an arrangement could be come to with Mr. Pearce on a salary basis. The chairman, Alderman Dagnall, said that Mr. Pearce was one of the finest electrical engineers in the country, and they did not want to lose his very valuable services. The commission would amount to £7,000 or £8,000 during the next ten or twelve years. The grounds upon which the recommendation was opposed were that the principle of paying a percentage to a full-time salaried official was wrong, and that if the salary was insufficient the right thing to do was to come forward with a plain proposal to increase it. After further consideration of the matter between the chairman and Mr. Pearce it will come before the Council again.

Mr. W. G. PICKVANCE, chief electrical engineer to Wrexham Corporation, recently tendered his resignation in consequence of continued ill-health. The Council at a specially-called meeting decided to accept the resignation, and expressed regret at Mr. Pickvance's indisposition, and recorded its high appreciation of his services during the past 13 years, and its sincere wishes for his complete recovery and future welfare. During the war, when shells were urgently required, he took this matter up with great energy and success. Pending the appointment of a successor the position of electrical engineer will be filled by Mr. Pickvance's former assistant, Mr. S. Thornton, of Thornton & Evans, electricians, Wrexham.

Mr. T. L. R. COOPER (formerly managing director of Messrs. Submersible Motors, Ltd., Southall), who for the last few years has been acting as advisory electrical engineer to Messrs. Arthur Lyon & Wrench, whose business changes are referred to in our "Business Notices" to-day, has removed from Victoria Street to 11, Tothill Street, Westminster, where he is dealing with his patents and carrying on advisory business for other firms.

Mr. J. V. SPARROW, who for the past 15 years has been representative for the General Electric Co., Ltd., at Cardiff and Swansea, has now resigned to take up an appointment with Messrs. Cooper & King, Ltd., of Cardiff.

Advances in salaries granted by the Worcester City Council are detailed in a note on p. 79.

Obituary.—MR. C. BLIZZARD.—The death is announced from Philadelphia, at the age of 56 years, of Mr. Charles Blizzard, the third vice-president of the Electric Storage Battery Co., of that city, and an active member of the old American Electric Vehicle Association and the American Associated Manufacturers of Electrical Supplies.

SIR CHARLES PETRIE.—We regret to record that Sir Charles Petrie, Bart., D.L., passed away on July 8th at his residence at Liverpool at the age of 67 years.

NEW COMPANIES REGISTERED.

W. Brearley (Rochdale), Ltd. (168,892).—Private company. Registered July 8th. Capital, £2,500 in £1 shares. To carry on the business of makers of and dealers in metallic packings, boilers, steam pipes, valve steam supports and supporting mechanism, valve stems, and similar moving rods, marine and other engines, motor cars, dynamos, &c., and to acquire the business carried on by W. Brearley at Toad Lane, Rochdale. The subscribers (each with one share) are: E. Freer, 45, Whitworth Road, Rochdale, newsagent; A. Fallon, 74, Oldham Road, Rochdale, baker; J. E. Jenkins, 14, Baildon Road, Rochdale, secretary. The first directors are not named. Secretary: J. E. Jenkins. Registered office: 52, Toad Lane, Rochdale, Lancs.

Weldrics, Ltd. (168,838).—Private company. Registered July 6th. Capital, £3,000 in £1 shares. To adopt an agreement with W. H. Boorne, The Rose Street Foundry & Engineering Co., Ltd., F. A. Bullivant, P. J. Bullivant, B. S. Bullivant, and A. W. Bullivant, and to carry on the business of mechanical and electrical engineers, metal workers, iron and steel converters, &c. The first directors are: A. W. Bullivant, 72, Mark Lane, E.C.; S. H. Gordon, 2, Rose Street, Inverness; W. H. Boorne, Bush Lane House, Cannon Street, E.C. Registered office: Bush Lane House, Bush Lane, Cannon Street, E.C. 4.

Hay, Maryon & Co., Ltd. (168,803).—Private company. Registered July 5th. Capital, £10,000 in £1 shares. To carry on the business of electrical, mechanical, mining, civil, agricultural, motor, and general engineers, general engineers' sundriesmen, &c. The first directors are: M. Hay, A.M.I.Mech.E., Pyrford Green House, Pyrford Green, near Woking. J. F. Maryon, Hill View, Cromer Road, Sheringham; L. C. Lane, Barnmead Road, Beckenham. Qualification: £100. Registered office: 14, Bride Lane, Ludgate Circus, E.C. 4.

Daysohms, Ltd. (168,786).—Private company. Registered July 3rd. Capital, £25,000 in £1 shares (10,000 non-cumulative participating preferred). To acquire and turn to account certain patents for inventions relating to electro-magnetic clutches and electric current regulating transformers, together with the trademark "Daysohms," used in connection therewith. The first directors are: Sir Philip Dawson, M.I.C.E., &c., Maybourne, Laurie Park, S.E.; W. B. Esson, M.I.C.E., &c., 46, Parkside, Kensington, W.; W. L. Davies, M.I.E.E., 112, Kenilworth Road, Wimbledon Park, S.W.; A. Soames, 22, Westminster Mansions, S.W.; W. A. Hunter, Charlton Lodge, Thornton Heath; J. Caldwell, M.I.C.E., &c., Nanfans Grange, Great Missenden, Bucks. Secretary: J. Lomax. Solicitor: B. H. Wilkinson, 108a, Cannon Street, E.C. Registered office: 14-16, Cockspur Street, S.W. 1.

Mitchells Electrical & Wireless, Ltd. (168,754).—Private company. Registered July 2nd. Capital, £5,000 in £1 shares. To take over the retail and electrical contracting branch of the business of F. L. Mitchell and Co., Ltd., carried on at 182 and 188, Rye Lane, Peckham, S.E. The first directors are: F. L. Mitchell, 231, Peckham Rye, S.E.; A. W. Knight, 26, Stanburry Road, Peckham, S.E. Registered office: 188, Rye Lane, Peckham, S.E.

Ellison Bros., Ltd.—Registered July 6th, to carry on the business of electrical and mechanical engineers. Nominal capital, £6,000 in 6,000 £1 shares. Directors: A. Ellison, Wild Grove House, Thornbury, Bradford; F. Ellison, Wild Grove House, Thornbury, Bradford. Napier Works, 1,226, Leeds Road, Bradford.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

B. M. Starter Co., Ltd.—Land registry charge on 8, Ainger Road, N.W., dated June 25th, 1920, to secure £600. Holder: T. B. Stephens, 234-240, High Street, Stoke Newington.

Electromotors, Ltd. (60,826).—Capital, £100,000 in £1 shares. Return dated June 4th, 1920. 84,740 shares taken up. £84,740 paid. Mortgages and charges, nil.

CITY NOTES.

Great Northern Telegraph Co., Ltd., of Denmark.

In their report for 1919 the directors say that it proved impossible during the year to repair all the company's European cables that were interrupted during the war. "The large number of mines which have been scattered broadcast in the seas by the belligerents, and which are swept up none too quickly, prevent the repair of one of the Anglo-Danish and one of the Franco-Danish cables. In addition, the cable between Libau and Petrograd remains interrupted. All the breaks in the cables mentioned above that occurred outside the minefields have, however, been repaired, and thus the necessary preparatory steps for their final restoration in the shortest

possible time have been taken." The second of the company's two cables between France and Denmark was put into working order last November, and the direct telegraphic service between the two countries was thereby re-established after having been interrupted for 27 months. During the whole of 1919 the company's offices at Vladivostock and Irkutsk have kept up the telegraphic communication between Siberia and foreign countries, via Japan and China respectively, but the internal strife in Russia and the wars between Russia and other countries have prevented the Vladivostock and Kiachta routes from participating in the transmission of the very heavy traffic between Europe and the Far East, the whole burden of which has, consequently, for a time been thrown upon the Eastern Co.'s route via India. The connections linking up Russia with Western Europe still remain broken. The trend of events seems, however, to indicate that the wall which so long has isolated Russia from the commonwealth of nations is about to be pierced. In that event the company is prepared to resume operations in Petrograd, and the moment is, perhaps, near when the Vladivostock and Kiachta routes will again be able to transmit their share of the traffic between Europe and the Far East. The untrammelled intercourse between nations, which followed after the armistice of November, 1918, and the Treaty of Peace of June, 1919, has given rise to an enormously increased telegraphic correspondence all over the world. Most of the lines have been, and still are, blocked with telegrams. The financial results of the year prove that the company's cables also have had an unusually large traffic to transmit. In the Far East the local traffic has been subject to some delay, and both there and in Europe the strengthening of the existing routes by new cables has become an absolute necessity. The company has in different directions had to face quite a new order of things, and negotiations have been entered into with several Governments, especially with Finland and the New Baltic States. The new cable steamer which is to replace the *H. C. Orsted* in European waters, will be built at the Royal Naval Dockyard at Copenhagen. The cable depot at Tuborg has been removed to the new depot at the Free Port of Copenhagen. According to existing agreements, rates have been reduced for the local traffic in the Far East, as well as for the traffic between Europe and America, on the one side, and the Far East on the other. A loan of 4,000,000 Danish crowns has been granted to the Finnish Government for the purpose of developing the telegraph and telephone system of Finland. In order to meet the increasing working expenses many telegraph administrations have raised the rates for internal telegrams; the international rates, however, remain as yet unaltered, although it would seem to be necessary to raise them also, at all events so far as the European regime is concerned. The company's nearest future, both in its financial and other aspects, will be strongly affected by the consequences of the war. One of these is the continued interruption of the company's main route, viz., that between Europe and the Far East through the old Russian Empire. The very considerable loss of traffic caused by this interruption has hitherto been counter-balanced by certain revenues; but in the current year such compensation can be reckoned upon to a limited extent only. As already mentioned, it is to be hoped that the company's transit route through Russia may be re-established, but, at all events, until this hope materialises, the receipts will show a considerable decrease. In view of the fact that expenses are increasing and receipts decreasing, the directors recommend the distribution of a dividend of 22 per cent. only, notwithstanding the satisfactory result of the year's working. It will thus be possible to increase the amount carried over to the year 1920—which probably will prove a meagre one. The receipts of 1919 are about £520,170 higher than those of 1918, but the expenses have increased by £448,362. Of the net receipts £61,111 is put to reserve and renewal fund, and £55,556 to renewal fund for cable steamers. Even with this addition the latter fund is insufficient to meet the cost of the two new boats which are necessary. The contribution to the pension fund of the staff has been fixed at £41,667, as against £13,889 last year. The balance carried forward is £96,252 higher than last year.

General Electric Co., Ltd.

Mr. Hugo Hirst presided over the annual meeting on Tuesday last at Winchester House, E.C. In proposing the adoption of the report, he said that the company was originally a private business, and private interests controlled for many years, right up to the beginning of the war, the destinies of the company. Under such conditions it was only natural that the expansion of the business was limited by the ambition, tastes, and qualifications of a number of prominent shareholders, who, with a regard for the safety of their possessions, were extremely careful. To some extent the company to-day benefited from that conservatism. The system of generous reserves and depreciations which had at all times been practised, and the modest dividends that had been declared during the first decade of its existence as a company, in spite of considerable earning capacity, had contributed to give them solid foundations of which they were now reaping the benefit. On the other hand, at the outbreak of the war it was realised how backward was the state of the electrical industry in this country, how much it depended on the foreigner as regarded experience, processes, patents, and even materials. When that situation arose the company realised that it might have the necessary qualifications to meet the country's requirements. Private interests stepped willingly aside for the common weal, and the programme of expansion was conceived in 1916, though the conditions of the war restricted their immediate activities towards its consummation. It was only towards the end of the war, and particularly since the armistice, that the real process of expansion commenced, and at the rate at which they were going on the process was likely to last for some years. Under such conditions, the directors had to be doubly anxious and careful that the non-productive capital in the company should be kept within such limits that it did not too seriously interfere with the yearly net results. One could not carry through such a programme by periodic large increases of capital without great risks, but by financing it with a large credit from the bank such as they have been able to do, by just drawing the money as and when they required it, and no more, it was possible. He would like to take the opportunity publicly to thank the late Sir Edward Holden, who granted them in the first instance those facilities. Whilst aiming at covering, in due course, the whole field of the electrical industry, they had up to the present concentrated their efforts mainly on strengthening the sections which were already represented. Some years ago they acquired the firm of Fraser & Chalmers, and their turbine department was one of their principal assets. They had made provision for doubling the output, and the work was nearly completed. They were about to extend considerably the mining machinery department, for which that firm had a great reputation. That policy brought along the necessity for increasing the output on the electrical side at Witton. For large generators a big bay had been erected; a new building for switchgear was in course of construction. New shops for fans and small industrial motors had been laid down, and, although the programme would double their electric plant output, considerable additions would have to be made if, in due course, they were asked to take a share in the electrification of railways, in the development of the hydro-electric plant, the laying down of big power stations, and a more generally extended application of electricity in the industrial field. The growing scarcity of coal and its present cost of production might jeopardise the industrial life of many countries. One and all, they were studying the utilisation of every ounce of water power, so that they might be made independent of so fickle a helpmate as coal had turned out to be in recent years. Before long, they hoped to double their output of electric lamps, one of the staple productions of the company. The new buildings at Hammersmith for that purpose were approaching completion; new patents, methods and processes that had developed during the war had been studied by their experts in the States and on the Continent. Machinery had been ordered, and some had already been delivered. The services which their lamp works had rendered during the war in other directions had hampered their progress in the natural development of that important department, and it was high time that they brought themselves again up to date. The glass works at Lemington had been largely extended in order to feed the increased lamp works. The fixtures, accessories, heating, and cooking apparatus works had all suffered through conditions of war, but new buildings and equipments had been provided, and these departments, the original business of the company, were again showing a pleasant upward curve. The carbon works, partly through importation, and partly through the arrival of the half-watt lamp, had drifted back into their pre-war impotence, and would be a difficult problem in the future. On the other hand, the lamp black works, which were originally started as an accessory to the carbon works, had shown great vitality and adaptability. Considerable capital had been required for the enlargement of their various successful enterprises, which figured in the balance sheet as trade investments. The Pirelli-General cable works had been extended and considerable additions were again in progress. The Express Lift Co. promised to become a very important and successful asset. Some 100 acres of land and some factories had been acquired at Wembley for the greater development of their general engineering works, their lamp and glass industries, and their research laboratories, buildings for which were in process of erection. Finally, very big extensions were contemplated at the Peel Conner Works, which were practically owned by them. The whole of the telephone industry had been at a standstill throughout the war. Before the war, as far as this and other European countries was concerned, it was already a back number. The demands, in their opinion, would be as great or greater than that of any section of the future electrical business. The higher wages ruling throughout the world had made automatic telephony a practical proposition. Their present works at Manchester were full up for some years, and could not be extended. They had provided for the Peel Conner Works the necessary capital for erecting entirely new works at Coventry, alongside the magneto works, which were also controlled by them, and formed part of their investments. Although those works could easily be filled for some years to come with contracts for central batteries, exchange equipments and telephone apparatus for domestic use, they meant to start immediately on the construction of automatic exchanges as well, with the assistance of some of the most prominent telephone experts. They had secured a system which they had every reason to

hope would meet with the approval of the authorities. They laid so much stress and importance on having their full share in the telephone business that they had decided to acquire all the shares of the Peel Conner Telephone Co., which were not yet theirs. They had also acquired considerable interest in a French telephone company, which would use their patterns and patents for the purpose of building up a telephone business in France. Some £50,000 was being spent on welfare buildings, sports grounds, and, to overcome the housing difficulties, they were building 100 workmen's cottages on their own site at Witton, and another 100 at Coventry. If they considered, by the side of all this construction work, the higher prices of all materials, they would readily understand that some part of the new capital recently acquired was wanted to finance their stocks, and must also provide a larger amount for debtors. There were those, thinking in pre-war values, who would regard their profits as excessive. As a matter of fact, to make the profits shown they had had to produce no less than £7,000,000 worth of values, a real addition to the national wealth. In his view profits in a vast manufacturing business were an index of efficiency and a standard for measuring strength, and, above all, a means for maintaining and upholding the State and Empire. Without profits they could not accumulate wealth. The State nowadays did not encourage profits; it seemed so much simpler for the politician to encroach on capital. The excess profits duty, as applied to them, was nothing short of an encroachment on capital. He would rather see the State encourage profits and tax them even 15 per cent. or more by a profits tax than continue to allow industry to grope in the uncertainty of an excess profits tax. If the workers only realised that the aim to be self-reliant, and the desire to earn profits were the mainsprings securing them continued employment, they would listen with less favour to those well-meaning, but misguided idealists who disdained profits and believed that the distribution of all capital would solve all social troubles. They would soon find out—as he had recently convinced himself they found out in Hungary—that capital by itself, unless made to work, was a will-o'-the-wisp. If the workers only knew how little the total profit which flowed into the shareholders' pockets was compared to the amount of wages paid, they would realise that nothing but increased production would help them to higher wages, cheaper cost of living, and better social conditions. In the balance sheet, the ratio of wages and dividends was about 8 to 1. If they were to deduct from the amount of dividend paid the sum the shareholders would have received had they lent their money to the Government, the surplus obtained by them for their risk, compared with wages paid, was in the ratio of 25 to 1. Nobody was more anxious than they were to assure the workers better conditions of life. Nobody admitted more readily the mistakes that had been committed by employers of previous generations, but in the interests of employer and worker alike, in the interests of the country, a way must be found to stop what was commonly called the "vicious circle." It started at the beginning of the war when the Government placed tremendous contracts in certain industries at cost, plus a certain percentage of profit. To attract labour quickly, the manufacturers did not mind what wages they paid—they received their commission. That created jealousy in other industries less favourably treated by the requirements of war, and the workers naturally claimed equal treatment with the others. Although it seemed at first impossible to grant it, manufacturers soon found there was no competition from without, and they could obtain their profit in spite of enhanced prices of labour. Gradually, every section of the community was so affected by the levelling up of the industrial workers that they claimed equal consideration, so it came about that materials, rates, foodstuffs, freights, and everything became dearer, and labour, with higher wages, could not make ends meet, and thus the process was repeated over and over again. So long as, owing to the common danger, the Government had unlimited borrowing powers, and so long as they were shut off from the world of competition, that state of affairs mattered little, but it all led to a deplorable state of inefficiency of production. To-day, when the Government had ceased to be a buyer, and was rather a seller of commodities, when the world's machinery of competitive industry was again being set in motion and speeded up, they must stop this inefficiency of production—they must produce cheaper, and they could only produce at a lower cost by producing more. Therein lay the safety of the worker so far as continued employment was concerned; therein lay the possibility of the worker being able to continue to reap the benefit of higher wages. If they produced commodities cheaply, so that the greatest number of people could avail themselves of such commodities, there would be continuous employment. If they allowed prices to soar higher and higher, only the few could buy, and the world's demand would be so curtailed that there would be over-production; factories and works would find out what was their duty. That might be a pessimistic picture, and he must give it them as his considered view of the situation, but he did not doubt that in the long run, the commonsense of our people would find out what was their duty. He was confident that, after a period of uncertainty and hesitation, wiser counsels would prevail, the peril to which the country was exposed would be clearly seen, and every Englishman would put his shoulder to the wheel of industry, and by a great co-operative effort secure the future of the nation and the Empire.

Mr. M. F. Armstrong seconded the motion, which, after a short discussion of a congratulatory character, was carried.

Fuller's United Electric Works, Ltd.

The report for the year ended March 31st, 1920, states that the profits, after charging all expenses of administration, including directors' fees, amount to £48,045. The directors recommend writing off as depreciation on plant and machinery £5,000, off preliminary expenses £6,500, paying a further dividend on the preference shares at the rate of 2 per cent. per annum, less tax, making 10 per cent. for the year, and of 10 per cent. per annum on the ordinary shares for the year, less tax, carrying forward, subject to taxation, £8,040. With regard to the liability for income tax and excess profits duty, negotiations are still proceeding with the Inland Revenue, and the amount payable by the company is still undetermined. But the directors are satisfied that the reserve of £14,000 and the carry forward of £8,040 will be more than sufficient to meet the maximum liability. The new buildings, machinery, and plant were complete only a few weeks before the year closed, so that the results expected from the use of the new capital received last year have been scarcely felt during the period under review. Owing to the rapidly increasing business and the higher cost of stocks it will be necessary to raise further capital, which the directors are of opinion can be profitably employed.—*Financial Times.*

Chili Telephone Co., Ltd.

The report for the year ended March, 1920, shows that the number of subscribers increased by 2,038 to 18,789. The lines in operation increased by 4,633 miles to 30,734. Gross revenue £225,011, a decrease of £11,091; total expenditure (exclusive of income tax) £152,207, a decrease of £1,746; net revenue £72,804, a decrease of £9,345. The average rate of exchange during the period covered by the accounts was 11¼d., as against 13¾d. during the preceding year; this decrease has adversely affected the sterling equivalent of the gross revenue. On the other hand, the rate on March 31st, 1920, was 13 9/16d., as against 9¾d. a year previously, and the difference on converting the liquid assets and liabilities in Chile at the former rate was £23,647, which amount has been carried to the general reserve account. The balance to the credit of the revenue account, after deducting income tax, and including £8,511 brought forward, is £68,560. In addition to the interim dividend of 3s. per share, free of tax, a final dividend at the same rate is to be paid; £10,316 to general reserve; £12,000 to the reserve for renewal of plant; balance to be carried forward £19,843, from which any E.P.D. will be provided. To enable the company to acquire the telephone business established in Antofagasta, the capital was increased in January last by the issue of 11,000 fully-paid shares at par.

Crompton and Co., Ltd.

Mr. A. A. Campbell Swinton, F.R.S., presided at this company's annual meeting on July 8th. He said that the item of freehold land, premises, plant, tools, &c., showed a considerable increase. Stock in hand also showed a considerable increase on last year's figures, partly due to the expansion of the business, partly to the higher prices of materials, and partly to work held up as a result of the moulders' strike. Sundry debtors also showed an increase. They were making a reserve for bad debts, but they were fortunate in that the percentage of debts they were unable to recover was very small. He might say that of the total debtors shown in the balance sheet about 80 per cent. had been paid since the accounts were closed. Investments stood at the same figure as a year ago. Cash at the bankers and in hand might appear to be large, but was accounted for by the fact that the last instalment on the new ordinary shares was paid in March. Turning to the other side of the accounts, there was a change in the amount of issued capital. The ordinary shares were increased from 76,769 to 326,769, being the 250,000 shares which were issued last year. The year's accounts had not benefited to any material extent by that new capital, the bulk of which only came in towards the close of the financial year. The number of preference shares issued had also increased by 5,285, being the shares which had been taken up during the year by the company's employés. Those employés' shares carried a bonus of 3 per cent. per annum. The debenture issue was decreased by the annual drawing which took place last December. The reserve fund was increased by the allocation which was made last year. Sundry creditors had also slightly increased. Turning to the profit and loss account, it would be seen that the amount earned during the year, after deducting all charges and depreciation, and, as last year, making a reserve for excess profits duty, income tax, and bad and doubtful debts, was £63,590. After deducting interest on debentures, directors' fees, &c., they had £52,878 to deal with, as against £38,828 a year ago. The year with which they were dealing had in many respects been abnormal. The demand for the company's goods and manufactures had been quite unprecedented, and they had been obliged to decline a very great deal of business which they could have taken if the capacity of their works had been larger. The orders booked during the year showed an increase on the previous year of 80 per

cent., and the unexecuted orders in hand at the close of the financial year represented a very large amount. The demand for electrical machinery had been equally brisk, both abroad and at home, and though in some respects as far as the home trade was concerned, there was some signs of falling off, he was inclined to think that they were not likely to feel that to the same extent in the case of the electrical trade as in some other trades, for the reason that the high cost of labour and material now rendered the use of electrical machinery as a labour-saving contrivance an absolute necessity in many industries. As a matter of fact, their ability to secure business to-day was only limited by their capacity to turn out the work. He did not anticipate any alteration in that position for some time to come. In view of the increasing demand on their manufacturing capacity they had been obliged to extend their original programme for new buildings at Chelmsford. Unfortunately, the difficulty of obtaining material and labour had delayed the execution of those works, and he was afraid it would be some little time before they had the full benefit of the expenditure that they were incurring, and as they would understand, a certain amount of dislocation of business had been caused by the carrying out of those building operations. The effects of the unfortunate moulders' strike which began in September last year had not even yet entirely passed away. It led to a great deal of holding up of work, and it caused them extra expense in trying to minimise the inconvenience to their customers, and it had had a very material effect upon their profits for the year. It was, therefore, with some satisfaction that they were able to present accounts showing a net profit of £52,878, which was approximately an increase of 37 per cent. upon the previous year's figures. For the year just ended, the rate of the excess profits duty worked out at a lower percentage than in the previous year, and no doubt that had helped in bringing about their improved profit. On previous occasions he had spoken rather strongly on the unfairness of the incidence of that duty, which was particularly hard on a company like theirs, which did not have a very good pre-war record. It was, therefore, a matter of considerable disappointment to the board that the Chancellor of the Exchequer should not only have reimposed the tax, but that he was undoubtedly going to increase it from 40 to 60 per cent. for the current year. He did not know whether the efforts of the business world to impress upon the Government the injuiry which that heavy duty was doing to the trade of the country would have any effect, but he devoutly hoped it would. As to the current year, he had told them that they started with a large amount of work in hand. Their trouble really was not to get orders, but not to offend their customers by their inability to supply them with what they wanted. That being the position, the directors were justified in looking forward with confidence to a successful year. For a good many years they had rented a recreation ground at Chelmsford for the benefit of their employés. With the increasing number the ground was becoming too small, and the board had taken an opportunity which afforded to buy the ground, together with an adjoining field, in all about 12½ acres, the whole of which was now being utilised as a sports ground. He was confident that the shareholders would approve of that action in providing adequate means of recreation for their staff and employés who served them so well. Sir Charles Parsons, one of the trustees for the debenture holders, had felt obliged to resign that position, and in his place the board had elected him (Mr. Swinton). Having referred to the appointment of Mr. S. W. Armstrong Noble and Sir Glynn Hamilton West as directors to represent Messrs. Armstrong, Whitworth & Co., on the board, he said that they were going to ask the shareholders to increase the borrowing powers of the directors. The business was expanding very fast, and in addition, owing to the very greatly increased cost of labour and materials in order to carry out a given volume of business, much more working capital was required. They thought it desirable that the board should be enabled to borrow such money as might be required for the business from time to time.

A resolution was carried removing the limit to the borrowing powers of the directors.

Anglo-Portuguese Telephone Co., Ltd.

Presiding at the annual meeting, last week, Mr. H. Allen referred to visits paid to Lisbon by Mr. Kerr and himself to discuss with Ministers and their departmental advisers the question of increased charges, which had become imperative. The discussions were complicated by changes in the Ministry, but they eventually got a fairly substantial part of what they sought, and the decree was signed and the new rates came into force as from June 15th. Neither from private subscribers nor from the commercial community was there any serious opposition. The directors could not very well settle the accounts and call this meeting with this vitally important question of tariffs hanging in the balance. Now, however, they felt justified in distributing, if not the entire profit of the year, at all events a larger proportion of it than in the previous three years. The increase in the tariff ranged for the different services, from 150 to 180 per cent., the higher rate applying to commercial establishments, which, of course, constituted the greater part of the business. That in itself was a very important point. This 150 to 180 per cent., by the way, was the increase upon the original tariff, and was inclusive of the two increases of 15 per cent. An increase of 150 to 180 per cent., of course, had a very attractive sound, but he warned them against attaching an exaggerated value to its effect on the profits, at least for the current year. Every expense attending the extension and conduct of such a business had gone up enormously of late years. After referring to the question of exchange the speaker said that the new tariff, even if it did nothing more, would afford temporary relief until the substitution of the measured or message rate for the inequitable fixed subscription for large and small users alike. Hitherto the authorities had opposed this change, but the Press and the public were gradually coming to see that people should pay for their telephone service according to the use they made of it. They might therefore expect that by the time the company was prepared to give the requisite facilities hostility to the institution of the message rate would have disappeared. They were now concentrating their efforts largely on the extension of exchange accommodation, which was sadly behind the requirements of the times. For the new Central Exchange in Lisbon, which was intended to have an ultimate capacity of 20,000 lines, they had, with some difficulty, found a splendid site in the business centre of the city. They were getting on with the plans and specifications. The material for the extension of the switchboard in the North Exchange arrived some months ago and was being installed. The extension of the building itself, in order to give still further switchboard accommodation, was also well in hand. This, together with a small temporary exchange in the present central building, would afford some slight relief to the present congestion, but the only permanent solution was to be found in an entirely new Central Exchange. The number of calls passing through all the company's exchanges last year was 38¾ millions, an increase of 3¼ millions over the number in the previous year. Although no arrangement had yet been arrived at for taking over the Government trunk lines, the service of which continued to be most unsatisfactory, steps were in contemplation under which the company would be enabled to introduce wireless telephony for the purpose of linking up Lisbon and Oporto with the other important towns of Portugal.

London Electric Railway Companies.

Underground Electric Railways Co. of London.—Subject to final audit the profit for the half-year ended June, 1920, after payment of 6 per cent. on the first cumulative income debenture stock, is £42. This does not allow of any payment on the 6 per cent. income bonds, and together with £22,938 brought forward, it has been carried to the special reserve for equalisation of interest.

London Electric Railway Co.—Dividend on the 4 per cent. preference stock of 2 per cent., and on the ordinary shares of ½ per cent., against 1 per cent. for the same period of 1919.

City & South London Railway Co.—Dividend on the 5 per cent. preference stocks 1891, 1896, 1901, and 1903 of 2½ per cent., and on the consolidated ordinary stock of ¼ per cent., against 1 per cent. for the same period of 1919.

Central London Railway Co.—Dividend of ¼ per cent. on the undivided ordinary stock, and of ½ per cent. on the preferred ordinary, against 2 per cent. for the same period of 1919.

Metropolitan District Railway Co.—Dividends of 2 per cent. on the 4 per cent. guaranteed stock; of 2½ per cent. on the 4½ per cent. first preference stock, and of 1¼ per cent. on the 5 per cent. second preference, against 2½ per cent. for the same period of 1919.

London General Omnibus Co.—The financial position does not justify the declaration of any interim dividend on the shares.

Prospectuses.—*Sir W. G. Armstrong, Whitworth & Co., Ltd.*—The list is to close on or before July 19th in an issue of £2,000,000 second mortgage debenture stock at 95 per cent., carrying interest at 6½ per cent. per annum.

Bournemouth & Poole Electricity Supply Co., Ltd.—The list was to close yesterday in an issue of £157,000 7½ per cent. seven-year notes at par. The money is required for providing additional generating plant and mains.

Mather & Platt, Ltd.—It is intended to issue a further 210,000 ordinary shares of £1 each to existing holders next month. It is also probable that an issue of shares will be offered to the employés on favourable terms. Capital is required to meet the cost of extensions now in progress at the works.

France.—The report of the Compagnie Francaise pour l'Exploitation des procédés Thomson-Houston, of Paris, for last year shows a profit of 11,008,920 fr., as compared with only 2,370,253 fr. in 1919. The dividend is being maintained at 40 fr. per share.

The report of the Société de l'Energie Electrique du Sud-Ouest, of Paris, for last year shows a big drop in both the turnover and the profits, the latter having amounted to only 470,268 fr., as compared with 2,046,843 fr. in 1918; no dividend is being declared.

Western Power Corporation.—Quarterly dividend of 1½ per cent. on the preferred stock.

Shawinigan Water & Power Co.—Dividend 1¾ per cent.

Kaministiquia Power Co.—Dividend 2 per cent.

Brazilian Traction, Light & Power Co.—The report for 1919 states that the revenue received under contracts with subsidiary companies was $8,500,234, interest on investments and miscellaneous income $376,771, together $8,877,005; less general and legal expenses and administration charges, $139,732; interest and charges on secured gold notes and other loans, $663,305; provision for general amortisation, $200,000; leaving net revenue $7,873,967. Dividends on preference shares at 6 per cent. per annum absorbed $600,000, leaving surplus for the year $7,273,967, which with the balance of $7,613,041 brought forward gives a total of $14,887,008. During the past three years $12,300,000 has been utilised towards meeting capital expenditure on the properties, and a corresponding amount has therefore been transferred to general reserve account, leaving $2,587,008 to be carried forward.—*Financial Times.*

British Thomson-Houston Co., Ltd.—The report for 1919 shows profits, after deducting all expenses and charges other than interest on debentures and loans, and after making provision for estimated war taxation, of £412,400, plus £150,863 brought forward. To depreciations, reserves, and adjustments £220,602 is applied, and £208,431 is to be carried forward. Out of the capital reserve account it is proposed to pay in full the accumulated dividends on the preference shares, £210,000 (being £5 5s. per £10 share), and to the ordinary shareholders £40,000 (being £1 per £10 share). It is proposed to capitalise this £250,000, and to issue fully-paid ordinary shares to that amount to the shareholders. The share capital is to be increased to £4,000,000.

Companies Struck off the Register.—The following companies have been struck off the register, and are dissolved:—

Phœnix Armouring & Cable Co., Ltd.
Munster Electric Lighting Co., Ltd.
Molybdenum, Ltd.
Lumina, Ltd.
London Decorative Metal Works, Ltd.
Cathodes, Ltd.
Blasberg Engineering Co., Ltd.
Alexandria Electrical and Engineering Works, Ltd.
William Taylor (Electric Lamp) Co., Ltd.

Stock Exchange Notices.—Dealings with the following securities have been specially allowed by the committee, under Temporary Regulation 4 (3):—

Babcock & Wilcox, Ltd.—73,828 ordinary shares of £1 each, fully paid, Nos. 2,075,001 to 2,148,828.

Application has been made to the Committee to allow the following to be officially quoted:—

Tramways, Light & Power Co., Ltd.—£350,170 5 per cent. debenture stock.

The following are to be officially quoted:—

Babcock & Wilcox, Ltd.—488,828 ordinary shares of £1 each, fully paid, Nos. 1,660,001 to 2,148,828.

Greenwood & Batley, Ltd.—174,195 ordinary shares of £1 each, fully paid, Nos. 180,391 to 354,585.

Brotherton Ediswan Tubes & Conduits, Ltd.—According to the *Financial Times*, the accounts for the year ended March 31st show a trading profit of £12,835, and after adding transfer fees and rents receivable, and deducting the amounts written off for depreciation of plant, bank charges and interest, directors' fees, excess profits duty, and with the amount brought forward, £19,119, a balance of £21,562 remains. The directors propose a dividend of 25 per cent. on the ordinary shares.

Pernambuco Tramways & Power Co.—Gross receipts for 1919, £436,756, and increase of £93,117; working expenses, £324,523, an increase of £71,595; net receipts £112,233, increase £21,522. After meeting debenture and other charges, £23,000 is put to renewal and general reserve, and 3½ per cent., free of tax, is to be paid on the 7 per cent. non-cumulative participating preference shares, leaving £16,909 to be carried forward.

Dublin United Electric Tramways Co., Ltd.—Interim dividends for the half-year ending June 30th at the rate of 6 per cent. per annum, less income tax, on the preference stock, and at the rate of 4 per cent. per annum, less income tax, on the ordinary.

Bombay Electric Supply & Tramways Co., Ltd.—A petition for confirmation of a scheme of arrangement between the company and the holders of the 6 per cent. cumulative preference and the ordinary shareholders is to be heard on July 20th.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—Dividends of 7 per cent. on the 7 per cent. preference shares for the year and 6 per cent. on the 6 per cent. preference shares for nine months to December, 1919. Carried forward £740.

Yorkshire (Woollen District) Electric Tramways, Ltd. Dividend 6 per cent. on the ordinary shares for the year 1919. Carried forward £9,677.

Clontarf (Dublin) & Hill of Howth (Electric) Tramroad Co.—Interim dividend of 3s. per share.

National Electric Supply Co., Ltd.—Interim dividend of 5 per cent. per annum, less tax, for the half-year, on the ordinary shares.

Telegraph Construction & Maintenance Co., Ltd.—Interim dividend of 6s. per share, free of tax.

STOCKS AND SHARES.

TUESDAY EVENING.

THE eagerly-expected speech by the Chancellor of the Exchequer failed to give any hope to those who looked for relief in E.P.D. this year. Stock Exchange markets, however, took very calmly whatever disappointment may have been felt with Mr. Chamberlain's decision. A sustained rise in gilt-edged stocks has induced cheerfulness in various directions, and industrials, after momentary hesitation, rallied easily enough. Cheaper money is declared to be advancing steadily nearer. Investors absorb good stock with readiness. The foreign field, as well as the domestic, is in favour.

Anglo-Argentine Tramways preference shares of both classes rose ¼ on the chairman's speech, reported in last week's ELECTRICAL REVIEW, at the meeting. Substantial rises in Argentine Railway stocks this week have served to revive interest in the industrial companies of the Republic, and the outlook is held to be brighter for business than has been the case since armistice-time. City of Buenos Aires Trams are firmer at 3⅛. Brazilians, on the other hand, are heavy, with Tractions ¼ down at 46¼. The effect of the report continues to be felt, although the hopeful still talk of the early resumption of 4 per cent. dividends. Rio Tramways First Mortgage bonds are 80½, and the Seconds 63½. Para Electric ordinary keep about 14s., and the old and new preference at 12s. Sao Paulo Tramway Firsts changed hands a few days ago at 85½; the 5 per cent. consolidated debenture stock was last dealt in at 58.

British Electric Traction ordinary stock is 35 cum div., but will go ex this week. The 6 per cent. cumulative participating preference is 63, affording yields over 9 per cent. at that price. London United Tramways 4 per cent. debenture stock can be bought at 31, and the preference at about a florin. London General Omnibus 4½ per cent. debenture stands at 67, and the 5 per cent. cumulative income debenture stock at 62½, which latter is the same price as is quoted for Metropolitan Tramways 5 per cent. debenture stock. All the liveliness has subsided from London & Suburban Tractions, and the ordinary stick at 1s. 10½d., the preference at 3s. The company's 4½ per cent. debenture stock is 40; the 5 per cent. "A" debenture stock has fallen back to 68. Many of these stocks and shares change hands but seldom, and the reason for their occasional mention in this letter is that it may serve to keep stockholders in touch with prices which otherwise they might hardly see at all.

Marconis are recovering from the weakness which overtook them on the Government's announcement in reference to the Imperial chain of wireless stations. The price has risen 3/16 to 3 7/16, and the preference are sympathetically better at 3⅛. The new ordinary came up from 2⅛ to 3 1/16. Canadians keep close to 10s. United River Plate Telephones have eased off to 7. Anglo-American Telegraph preferred hardened to 79½, but the deferred at 17½ is 5s. lower. The Eastern group is unusually quiet, so far as changes are concerned. Great Northerns and Indo-Europeans remain flat.

In the home railway market, Underground Electric Income Bonds have given way sharply, owing to the dividend declaration of the company, showing that not only is the half-yearly interest passed altogether on the bonds, but the amount to be added to the carry-forward comes to the bagatelle of 40 guineas. The group has done badly, as the following figures show:—

Company.	Interim dividends per cent. 1919.	1920.
City & South London Ord.	2	¼
London Electric Ord.	2	¼
Metropolitan District 2nd Pref. ...	5	2½
Und. Elec. Rlys. Income Bonds ...	6	nil.
Central London	4	¼
London General Omnibus	8	nil.

The 6 per cent. First Cumulative Income Debenture stock of the Underground Railways will receive its interest on September 1st at the full rate. It is not surprising that in these circumstances the market for the stock should be flat, although the optimists maintain that prices may be regarded as at their lowest level, having regard to the strong probability that Parliament will give permission for fares to be raised in accordance with the Bill which has lately passed the third reading in the Houses of Parliament. Metropolitans and Districts are both ¼ higher.

The market for home electricity shares is still dull; not a sign of life appears in any of its shares. The way in which the gas strike spread was not regarded as a bull point for electricity supply, while, of course, at this time of year popular attention is always lacking, nor is it until the autumn that investors begin to take any interest in illumination shares as a rule. Edmundson's report showed £14,800 available for distribution, but no dividend is paid, £10,000 going to the carry-forward. The ordinary stand at 5s., the £5 preference at 40s., and the 6 per cent. non-cumulative preference at 11s., while the 4½ per cent. debenture is about 63½.

Cromptons have gone back a shilling to 21s., in spite of the chairman's statement at the meeting the other day to the effect that the demand for the company's manufactures during the past year had been quite unprecedented, and they had been obliged to decline a good deal of business which, had the capacity of their works been larger, they would have been glad to undertake. General Electric Ordinary stiffened to 33s., and the new Ordinary to 30s. middle. Callenders old preference are a better market at 18s. Babcock & Wilcox went back to 2 9/16 in company with various other engineering and similar shares, but the decline was regained.

In the armament list, Vickers have recovered to 25s. 6d., after the drop to 24s. which occurred on the success of Admiral Sir Percy Scott in his lawsuit against the company. The issue of Armstrong Debentures, the coming of which was mentioned here a fortnight ago, has had no further effect upon the price of the shares, which improved to 26s. The cable manufacturing issues are marking time. Rubber shares improved sharply, as buyers came in who are encouraged by the outlook for a possible rise in the price of the raw stuff in the autumn, when evidence of shortage is expected to make itself manifest. In commercial stocks and shares as a whole, there is a revival of public interest this week, and rumours are current as to several new issues which are said to be anxious to make their appeals to the public before the holiday season sets in next month. Vickers has a million-and-a-half of 7 per cent. notes to be offered at 95. The Calcutta Electric has been underwriting, at a commission of 2½ per cent., half-a-million pounds of 5 per cent. tax-free debenture stock at 95. There is talk of a possible new issue, too, from the Brush Co., in whose ordinary stock the last-recorded bargain was at 120¾ three weeks ago.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price July 13, 1920.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	8	12	6½	—	£9 8 3
Charing Cross Ordinary	4	7	3½	—	10 0 0
do. do. do 4½ Pref.	4½	4½	2¾	—	8 3 8
Chelsea	8	4	2½	—	6 0 0
City of London	8	10	1¼	—	8 17 10
do. do. 6 per cent. Pref.	6	6	17/-	—	7 1 1
County of London	7	8	2¾	—	9 17 0
do do. 6 per cent. Pref.	6	6	2½	—	7 5 5
Kensington Ordinary	6	7	4	—	8 15 0
London Electric	Nil	2½	1½	—	6 0 0
do. do. 6 per cent. Pref.	6	6	3	—	10 0 0
Metropolitan	5	6	3½	—	10 8 6
do. 4½ per cent. Pref.	4½	4½	2¾	—	8 0 0
St. James' and Pall Mall	10	12	5½	—	8 16 10
South London	6	6	3½	—	9 13 0
South Metropolitan Pref.	7	7	18/9	—	7 0 0
Westminster Ordinary	8	10	5½	—	9 15 2
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	79½	+1	7 11 0
do. Def.	23/6	1½	17½	— ½	8 11 5
Chile Telephone	6	6	6½	—	*4 18 1
Cuba Sub. Ord.	7	7	8½	—	*8 4 8
Eastern Extension	8	10	14½	—	*6 18 0
Eastern Tel. Ord.	8	10	145/8	—	*6 17 6
Globe Tel. and T. Ord.	8	10	10½	—	*8 7 0
do. do. Pref.	6	6	8½	—	7 1 2
Great Northern Tel.	22	22	21½	—	10 4 8
Indo-European	13	10	30	—	8 6 8
Marconi	25	25	3 7/16	— 7/16	7 5 4
Oriental Telephone Ord.	10	12	3 7/16	—	*5 4 4
United K. Plate Tel.	8	8	7	— ½	*5 14 4
West India and Panama	1/8	Nil	5/16	—	Nil
Western Telegraph	8	10	15	—	*6 13
HOME RAILS.					
Central London Ord. Assented	4	4	44½	—	9 19 9
Metropolitan	1	1½	21	+ ½	5 19 1
do. District	Nil	Nil	15¼	+ ¼	Nil
Underground Electric Ordinary	Nil	Nil	1½	—	Nil
do. do. "A"	Nil	Nil	4 6	—	Nil
do. do. Income	5	4	54½	—3	—
FOREIGN TRAMS, &c.					
Anglo-Arg. Trams. First Pref.	Nil	5½	3¾	+ ¼	7 17 2
do. do. 2nd Pref.	Nil	Nil	5/8	+ ⅛	Nil
do. do. 5 Deb.	5	5	5½	—	8 11 0
Brazil Tractions	Nil	Nil	4½	— ½	Nil
Bombay Electric Pref.	6	6	13	—	4 10 0
British Columbia Elec. Rly. Pfce.	5	5	58½	—	8 11 6
do. do. Preferrred	2½	5	53½	—	9 7 0
do. do. Deferred	Nil	8	54½	+1	5 10 1
do. do. Deb.	4½	4½	54	—	7 17 5
Mexico Trams 5 per cent. Bonds	Nil	Nil	38	—1	Nil
do. 6 per cent. Bonds	Nil	Nil	29	—1	Nil
Mexican Light Common	Nil	Nil	14	—	Nil
do. Pref.	Nil	Nil	27½	—	Nil
do. 1st Bonds	Nil	Nil	48	—1	Nil
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	2⅝	—	*5 14 4
British Aluminium Ord.	10	10	1 7/16	—	9 8 2
British Insulated Ord.	12½	15	1 13/16	—	8 5 6
Callenders	25	15	1 7/16	—	11 8 6
,, 6½ Pref.	6½	6½	18/-	+6d.	7 4 5
Castner-Kellner	20	17	3	—	5 13 4
Crompton Ord.	10	10	21/-	—1/-	9 10
Edison-Swan, "A"	10	10	1½	—	7 12 4
do. do. 5 per cent. Deb.	5	5	78½	—	6 5 9
Electric Construction	10	10	1	—1/-	10 0 0
Gen. Elec. Pref.	6½	6½	18/6	—	7 0 5
do. Ord.	10	—	39/-	+6d.	*6 1 2
Henley	25	15	1¼	—	8 0 0
do. 4½ Pref.	4½	4½	6½	—	6 18 6
India-Rubber	10	10	13	—	*7 12 10
Met.-Vickers Pref.	—	8	3½	—	7 2 8
Siemens Ord.	10	10	20/-	—	*7 12 10
Telegraph Con.	20	20	21½	—	*5 11 8

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Tuesday, July 13th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	2/10	...
a Ammoniac Sal	per ton	£100	...
a Ammonia, Muriate (large crystal)	,,	£92	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£42	...
a Copper Sulphate	,,	£47	£1 dec.
a Potash, Chlorate	per lb.	1/-	...
a ,, Perchlorate	,,	1/8	...
a Shellac	per cwt.	£93	£1 10s. inc.
a Sulphate of Magnesia	per ton	£18	...
a Sulphur, Sublimed Flowers	,,	£28	...
a ,, Lump	,,	£25	...
a Soda, Chlorate	per lb.	6d.	...
a ,, Crystals	per ton	£12	...
a Sodium Bichromate, casks	per lb.	...	...
METALS, &c.			
g Babbitt's Metal Ingots	per ton	£118 to £345	
c Brass (rolled metal 2" to 12" basis)	per lb.	1/8½	½d. inc.
c ,, Tubes (solid drawn)	,,	1/6 to 1/6½	½d. inc.
c ,, Wire, basis	,,	1/8½	½d. inc.
c Copper Tubes (solid drawn)	,,	1/8½	½d. inc.
g ,, Bars (best selected)	per ton	£164	£3 inc.
g ,, Sheet	,,	£161	£3 inc.
g ,, Rod	,,	£161	£3 inc.
d ,, (Electrolytic) Bars	,,	£110	£5 inc.
d ,, ,, Sheets	,,	£156	...
d ,, ,, Wire Rods	,,	£125	£5 inc.
d ,, ,, H.C. Wire	per lb.	1/4	½d. inc.
f Ebonite Rod	,,	3/-	...
f ,, Sheet	,,	2/6	...
n German Silver Wire	,,	3/-	...
h Gutta-percha, fine	,,	14/-	1s. inc.
h India-rubber, Para fine	,,	1/11	2½d. dec.
i Iron Pig (Cleveland Warrants)	per ton	Nom.	...
l ,, Wire, galv. No. 8, P.O. qual.	,,	£59	...
g Lead, English Pig	,,	£37 10s.	£2 10s. inc.
g Mercury	per bot.	£20 10s. to £21	10/- to 20/- inc
e Mica (in original cases) small	per lb.	6d. to 4/6	...
e ,, ,, ,, medium	,,	5/- to 10/-	...
g ,, ,, ,, large	,,	12/6 to 25/- & up	...
g Phosphor Bronze, plain castings	,,	1/6 to 1/11	...
g ,, ,, rolled bars and rods	,,	2/3 to 2/6	...
d ,, ,, rolled strip & sheet	,,	2/3 to 2/9	...
r Silicium Bronze Wire	per lb.	1/11½	½d. inc.
g Steel, Magnet, in bars	,,	1/8	...
n Tin, Block (English)	per ton	£266 to £267	£20 inc.
e ,, Wire, Nos. 1 to 16	per lb.	4/9	...
White Anti-friction Metals	per ton	£90 to £345	...

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespears.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Electrical Utilities Corporation.—Quarterly dividend of 1¼ per cent. on the preferred stock.

Colombo Electric Tramways & Lighting Co., Ltd.—Profit for 1919 £48,324. To general reserve and renewal £20,000; dividend of 10 per cent., free of tax; carried forward £15,240.

Motor-Car Lights. — The problem of motor-car headlights, which will give sufficient driving light and at the same time will not dazzle is discussed, as are also the difficulties experienced in illumination during fogs, in the *Optician and Scientific Instrument Maker*. Several devices which are claimed to satisfy the conditions are described, the simplest method being to paint dark the portion of the reflector which sends light upwards, or the part of the lamp through which the light reaches the reflector. In the offset reflector the two halves are separated, the upper half being further from, and the lower half nearer to, the lamp than the focal distance. Thus both halves throw beams of light downwards only. In another headlight the two halves of the reflector are hinged at the vertex, so that by turning one half, or both halves, the driver can concentrate the light upwards or downwards, or distribute it evenly. A headlight with two lamps, arranged vertically, with an opaque shield between, gives somewhat similar results. The upper lamp is fixed in a position to throw light, after reflection, at the upper half of the reflector, downwards. The lower lamp may be moved inside or outside the focus so as to give a beam of light directed downwards or upwards, as desired. A number of different types of lenses have been designed to meet the required conditions. In one type the lower half of the lens consists of two sets of obliquely parallel prisms, so that the emergent light spreads out in a broad fan over the entire surface of the road and the strip of land on either side. The upper half is made up of a series of concentric semi-rectangular prisms which refract the rays inwards and downwards to form a dense, brilliant, narrow shaft of light shining down the centre of the road.—*Technical Review.*

WATER-POWER DEVELOPMENT.

By L. B. WOOD, A.M.I.E.E.

Never in the history of Great Britain has there been such a pressing demand for an abundant supply of cheap power. Previous to the world crisis, coal, with which these islands are richly endowed, was so cheap and plentiful that it was thought that no other source of energy could compete with it. To-day we have the biggest trade boom the country ever knew, when all the world is simply starving for supplies, but our industries are totally unable to expand to meet the demands, because there is a great shortage of fuel.

Coal is now more than double its pre-war price, and still rising; moreover, the supply is totally inadequate to meet our wants.

Much the same may be said of oil; though its production has rapidly increased during the last few years, so has its price; crude oil, as used for raising steam, and in certain types of internal-combustion engines, could, before the War, be bought for £3 5s. per ton, whereas to-day, it is round about £12 per ton. Moreover, the sphere of oil fuel is extending in every direction, and at the present rate of progress in the development of apparatus for using oil fuel, the demand will far outstrip the supply.

There are other considerations which militate against the universal adoption of oil; at the present time we are, as we always shall be, entirely dependent on foreign countries for our supplies, which have to be borne long sea voyages in ships which, in time of War, would be subject to submarine attack. It is also subject to market manipulations, and has to be handled many times before reaching the consumer.

The only other source of energy known to-day is water power. Unfortunately, these islands are not so well blessed in this direction as in the case of coal. We have no huge waterfalls like Niagara, Victoria, Ignassu, &c., capable of giving a continuous supply of millions of horse power, neither have we any great non-tidal rivers like the St. Lawrence with its great lakes, whose waters are derived from large catchment areas, but we have a limited amount, which, though of modest proportions, would, if developed, help out our coal supplies considerably.

Quoting figures from a survey of the water potentialities of the world, apart from tidal energy, it is estimated that England possesses 900,000 h.p. capable of development; but far greater possibilities depend on our ability to utilise the tidal flow of such rivers as we possess, that meet the requirements. The three great desiderata for a tidal plant are:—First, that there should be sufficient height of tide to obtain a good head; secondly, that there should be two natural reservoirs of large size, so that continuous power can be obtained; and thirdly, that the power plant should be central to the population to be served.

Without the first and second, the case for tidal energy is hopeless.

What promises to be the first great tidal development in the world is to take place at Hopewell, in Canada, where the initial development is to be 100,000 h.p., at an estimated cost of £2,100,000, or approximately £21 for each h.p.

In this case the two most important features exist; first, the tide is most regular, and is one of the highest in the world, with a spring rise of 45 ft., a neap rise of 38 ft., and a normal neap range of 32 ft. In the second place, nature has almost completely formed two large reservoirs where two rivers converge upon a tidal bay.

Up to the present the importance of water-power development has not been sufficiently appreciated in this country, and such schemes as have been projected have met with such fierce opposition, even from public sentiment, that they have been abandoned. Thus to-day we have no organised plans for future development of any magnitude, though certain reports say that a scheme has been projected to develop the tidal flow of the river Severn at Beachley, estimated to cost between £8,000,000 and £9,000,000, to be completed in five years; the amount of power resulting therefrom is not stated.

Let us consider what effect 900,000 h.p. would have on our industrial life if we had at the present moment that amount of power at our disposal. It represents considerably more than the total combined output of all the electric power stations in London. Imagine Greater London obtaining its light and power without the aid of coal.

In the most modern steam plants 2·5 lb. of coal is consumed in producing 1 h.p.-hr. of electricity, so that 900,000 h.p. would require nearly 9,000,000 tons per year; 900,000 10-ton trucks and 900 of the largest locomotives we possess would be required to haul this amount of coal, which water power would relieve for other duties.

Water power is many times more efficient than power produced from coal; at least 90 per cent. efficiency is obtained from the amount of water passing through the turbine, against 20 per cent. from coal.

The saving in man-power by producing energy from water power, as compared with steam power, is large, especially if the number of miners required to provide coal is considered. A large American power company has published statistics comparing the number of men to operate one of its hydro-electric plants, with the number, including miners, needed to operate one of its steam plants. In a water-power plant one man is required per 6,000 h.p. of capacity, whereas in a steam plant one man is required per 100 h.p., and assuming that 900,000 h.p. of water power would replace the same amount of steam power, over 8,000 men would be released for other duties; furthermore, water power is the only power which is not dependent for its source on the human element, and is thus immune from sectional strikes.

Quite recently the Chicago, Milwaukee and St. Paul Railroad of America opened for traffic a further length of 207 miles, making, with the 440 miles previously electrified, a total of 647 miles, and when the remaining strip of 212 miles is electrified, 95 electric locomotives will replace 250 steam locomotives.

Electric power for the operation of this line is supplied by water power, derived from the mountain ranges through which the line passes.

Substitution of hydro-electric power on this system will effect a saving in fuel, based on the business of 1918, of, approximately, 300,000 tons of coal and 40,000,000 gallons of oil fuel annually. Thus, the mountains provide the power whereby they are conquered.

France has water potentialities estimated to produce 9,000,000 h.p., of which only a fraction is developed; how differently she would be placed to-day if only 50 per cent. of the available amount had been developed.

Water power is the greatest asset a nation could possess, and any scheme, tidal or non-tidal, capable of commercial development, even at a great initial cost, should be pushed forward with the least possible delay.

A Water Power Commission should be established with powers to survey the whole country, to grant rights, and to remove all obstacles, so that the community may utilise the gifts of nature, now going to waste, and thus relieve the ever-increasing difficulties of our coal supply.

Tariff Policy.—At a meeting of the Executive Committee of the Tariff Reform League, held on Thursday last week (Chamberlain Day), at the House of Commons, a report presented by the General Purposes Committee was adopted, setting forth a definite tariff policy, and recommending its adoption by the League as the basis of an active educational campaign during the coming autumn and winter.

Australia and Trade with Germany.—According to an Australian paper just to hand, it was stated at Melbourne in May that in some cases Australian manufacturers had recently found that they were in urgent need of certain "key" machinery or tools which apparently could only be obtained from former enemy countries. It was represented that by applying the continued general embargo on trade with Germany and other former enemy countries to these particular cases, Australian industries were seriously hampered, while no special harm was done to the former enemy countries, as the things needed were generally quite small items, though indispensable. This question was recently put before the Federal Ministry. After consideration, it was decided that where it was clearly shown that certain things were indispensable to an Australian industry, and it was also proved that they could not be obtained excepting from Germany or some other former enemy country, licences should be granted for their importation to Australia. "Licences of this kind have already been granted in one or two special instances."

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A "Super Switch Plug."

Details of a new combined switch and plug shortly to be placed on the market are supplied by Mr. W. T. RAWCLIFFE, 3, Greengate, Victoria Bridge, Salford, Manchester. This device (illustrated in fig. 1) consists of a double-pole, quick break switch with earth connections, which is interlocking when the plug is in position and the current switched on. When either open or closed there are no "live" parts exposed, all details being effectively enclosed. The locking pin works one way only, and thus the same polarity is obtained in every case. Contact is made by inserting the plug and turning it to the "on" position.

A Small Lighting Transformer.

There are many cases in which it is required to keep a small light burning for long periods, and to effect this without the use of small batteries the BRITISH THOMSON-HOUSTON Co., LTD., Mazda House, 77, Upper Thames Street, E.C.4, has produced the "All-Nite-Lite" device, shown in fig. 2. This is a small transformer for use on an A.C. circuit of from

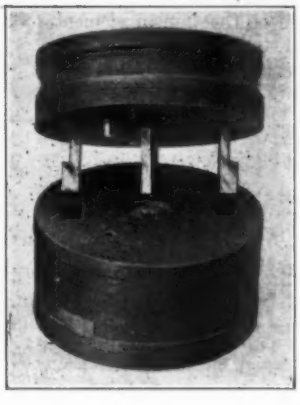


FIG. 1.—A "SUPER" SWITCH PLUG."

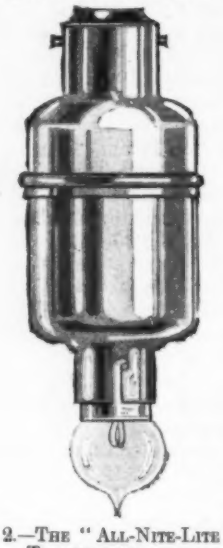


FIG. 2.—THE "ALL-NITE-LITE" TRANSFORMER.

50 to 140 cycles. It is made in two types, suitable for voltages of 100-150 and 200-250 respectively. At one end of the case is a bayonet adaptor to fit in the standard lampholder, and at the other end a miniature socket for a 6 volt, 3 c.p. bulb is fitted. The overall length of the device is 3¼ in., and it is stated that at ordinary supply rates a small light can be maintained for 40-60 hours at the cost of 1d.

The Martin Rotary Converter.

In our issue of October 31st, 1919, we gave brief particulars of the "Martin" rotary converter, a machine that is intended to supply energy for battery charging, kinematographs, or any other purposes that involve conversion of A.C. into D.C. This machine is a speciality of the ELECTRICAL ENGINEERING & EQUIPMENT Co., LTD., of 109-111, New Oxford Street, W.1. On account of the difficulty encountered in starting, the development and use of smaller sizes of rotary converters has been retarded and preference given to other types of plant. In the Martin rotary converter, however, this disadvantage has been entirely overcome, and the machine can be started as easily as an ordinary polyphase induction motor. On the occasion of a recent visit to the North Metropolitan Electric Power Supply Co.'s station at Winchmore Hill, N., we saw one of these converters running on load. The machine we inspected was designed to run on a 415-volt, 50-cycle, 3-phase supply, and its D.C. output was 20 KW. at from 70 to 110 volts at 1,000 R.P.M. After a 3-hours' full load test run the temperature of the machine had hardly risen above normal; it ran quite sparklessly, and indeed it seemed difficult to make it do anything that it should not do. There was no change in speed, and it continued to take its load without protest, even when the field circuit was broken. The Martin rotary converter is designed on novel lines; high voltage in the shunt fields when starting is eliminated by means of a damper ring which is introduced between the armature and the pole pieces as shown in fig. 3. The ring acts as a magnetic screen for the armature flux, diverting it through the magnetic circuit of the damper ring instead of the magnetic circuit on which the shunt fields are placed. The damper ring forms a continuous laminated magnetic circuit from pole to pole, and has alternate slots and squirrel-cage bars on its inside periphery. The riveting or welding of these bars to the copper end rings gives this improved converter the starting characteristics of an ordinary induction motor, and prevents hunting when once in step and under load conditions. The apparent paradox in the construction of the magnetic circuits is the secret of the machine's success. The continuous iron laminations of the damper ring would seem to short circuit the flux from the field poles, but in reality this is only true

FIG. 3.—COMPONENT PARTS OF MARTIN ROTARY.

when starting up, and is necessary to prevent high voltage in the shunt fields. In the slots of the damper ring is placed a small portion of the shunt windings which prevents magnetic leakage from pole to pole when the rotary falls in step. Any desired voltage regulation, from the characteristics of a shunt-would to those of a compound generator, can be obtained from this converter by proper design of the series winding which is placed in the slots of the damper ring midway between the pole centres. This winding also maintains the power factor of the rotary under load conditions. The converter will not run away on account of the fact that the series winding is placed on a separate magnetic circuit from the shunt winding, and the ratio of the ampere turns is such that there is no possibility of the flux from the series winding overcoming the stronger flux in the magnetic circuit of the main shunt fields. The steel field frame is made with inwardly projecting poles on which the shunt fields are placed. The pole pieces are bored out so as to form a driving fit for the damper ring which takes the place of the pole shoes on an ordinary machine.

Regulation of the D.C. voltage where necessary, say, for such purposes as battery charging, is effected in a simple and efficient manner, namely, by means of selector or regulating switches connected to tappings on the transformer which feeds the rotary; 25 to 33⅓ per cent. regulation can be obtained in this way without any resistance loss. For kinema work the same transformer may be used to give a stand-by supply, thus saving the cost of a special transformer for the purpose. A machine of this type is claimed to be much more efficient than a motor generator set, and as it runs with a slightly leading power factor, it is a desirable machine from a supply authority's point of view.

The "C.M.I." Magneto.

The "C.M.I." magneto (fig. 4) manufactured by the GENERAL ELECTRIC Co., LTD., 67, Queen Victoria St., E.C.4, although not exactly new, having two or three years of war service to its credit, deserves mention as an efficient ignition device. It is particularly applicable to heavy car or lorry

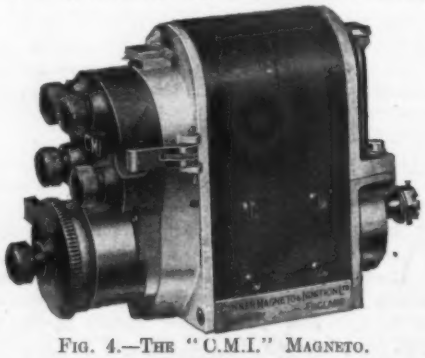


FIG. 4.—THE "C.M.I." MAGNETO.

engines on account of its uniform spark over the full range of adjustment, thus obviating the use of a separate battery ignition system for starting. The armature is supported on two high-grade ball bearings, and the outer ball race is adjustable for wear. The distributor gear shaft is also in an

adjustable bronze bearing lubricated by means of a wick immersed in an oil well. The condenser is composed of interleaved mica and tinfoil tested at 500 volts A.C. The contacts are made of a low resistance, hard wearing alloy of platinum and iridium. The magneto possesses a high finish, and is practically waterproof.

New Gas-filled Lamps.

An important advance in the art of electric lighting is announced by the British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames Street, E.C. 4. The costly research and experiments that led up to the production of the "Mazda" gas-filled electric lamp in 1914 have been continued.

It was recognised that the utility of the large sizes of the gas-filled lamp 100 watts and upwards) was confined to the illumination of wide areas, and householders and small shop-

Fig. 5.—40 watts, 100-130 volts.

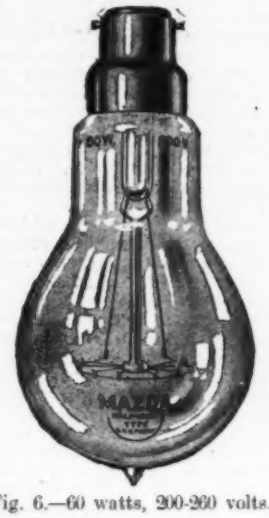


Fig. 6.—60 watts, 200-260 volts.

"Mazda" Gas-filled Lamps.

keepers had to be content with the vacuum type. Now, however, economically successful gas-filled lamps of smaller sizes have been developed, and a wide sphere of use is predicted for them. These new "Mazda" lamps are shown in the illustrations herewith. Fig. 5 is a 40-watt, 100-130-volt lamp, and fig. 6 a 60-watt, 200-260-volt type. The dimensions of the 40-watt size are 2⅜ in. diameter and 4¾ in. long, and the larger size is 2¾ in. in diameter and 5¾ in. long.

Electric Tire Inflator.

Messrs. Garage "Service" Equipment, Ltd., have supplied us with details of a new British tire inflator, the "Garso Junior" (fig. 7), designed to operate from an ordinary 12-volt accumulator. This is a self-contained unit comprising a ¼-h.p., 12 volt motor, and a compressor measuring 1¾ in. square, which will pump 1,000 cu. in. of free air per minute, and is capable of starting up against a pressure of 150 lb. per sq. in. The

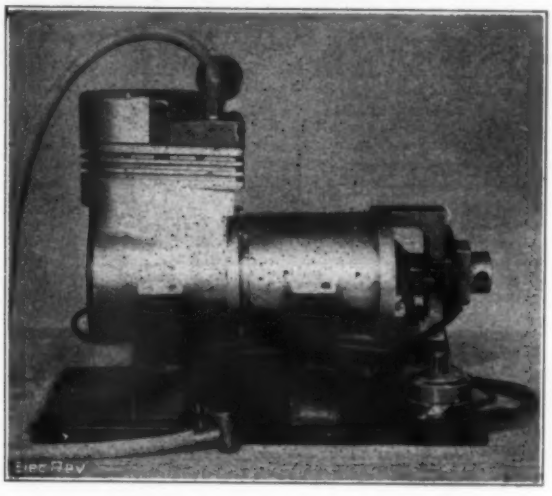


Fig. 7.—Electric Tire Inflator.

motor is fan-cooled, the commutator being easily demountable. The brushes are barried in two guides mounted on a ring contact, being maintained by two flat coil springs. The air is pumped through a small orifice into the air chamber, where it expands and cools, all oil, &c., being expelled. A pressure gauge registering from zero to 160 lb. is fitted. It is claimed that the device will inflate an 875 mm. by 115 mm. tire from flat to a pressure of 90 lb. per sq. in. in 8 min. 42 sec.

ELECTRIC RAILWAY CONTACT SYSTEMS.

By SIR PHILIP DAWSON, M.I.E.E.

(Abstract of paper read before the Institution of Electrical Engineers.)

(Concluded from page 61.)

In connection with the electrification of the Brighton Railway there is one section on the South London line over which there is practically no steam traffic, and which is practically entirely operated electrically, whilst on the other electrified sections there exists in addition to the electric service a very heavy steam service, which during the years of war was exceptionally increased owing to the abnormally heavy munition traffic handled by the Brighton Railway.

As will be seen from the following diagrams which have been taken from very careful records kept during the last ten years, the maintenance costs and renewals of the overhead construction are very largely affected by steam operation.

The efficiency of the overhead system as regards the very small number of defects and delays arising therefrom is shown in fig. 2. The larger number of defects in 1911 and 1912 over those in 1913 is due to the fact that the Crystal Palace line was opened in May, 1911, before it had been really properly completed, and the decrease in defects in 1913 is due to these having been remedied. The rise after 1914 is entirely due to the war, owing to the heavy munition steam traffic over the Crystal Palace line. Even so the defects which caused delays exceeding half-an-hour are extraordinarily rare.

Fig. 3 shows the percentage of both the primary and secondary insulators renewed on the whole system per annum; whilst fig. 4 shows the total number and percentage of primary and secondary insulators renewed on the South London and Crystal Palace lines. Not a single primary insulator has been renewed on the wholly electric section of the South London line. Considering that there are altogether 7,000 primary and 14,000 secondary insulators, the result shown can be considered to be eminently satisfactory.

Fig. 5 shows the percentage of trolley wire renewed on the whole of the overhead system since it was first operated electrically in 1909. The wear of the trolley wire is largely if not entirely dependent on the amount of current collected. This is borne out by the actual measurements carried out during the last ten years, the results of which are recorded in fig. 6. The wear on the trolley wire where no current is taken is nearly negligible.

Fig. 7 shows the percentage of catenary and dropper-wire renewals during the last ten years. Here again the large increase in these renewals during the years of war is practically entirely due to the extraordinary heavy steam traffic.

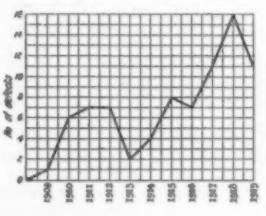


Fig. 2.

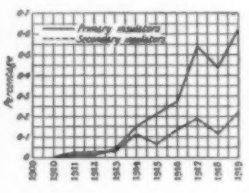


Fig. 3.

Fig. 2.—Overhead Defects Causing Delays to Traffic Working Exceeding 3 Minutes.

Fig. 3.—Percentage Renewal of Primary and Secondary Insulators per Annum.

The experience gained on the Brighton Railway, where very great precautions were taken in order to ensure absolute

safety of operation, has shown that a simpler form of construction and one which will considerably decrease the cost of construction and maintenance can be adopted, and one has been designed and tried, and will be employed in connection with any extensions which may be carried out.

Conductor Rails.

At the present moment there are three types of conductor rails in general use if we consider them from the point of view of form of current collection.

Over-running, where tahe shoe rests on the top portion of the rail, being kept there by means of gravity or springs.

Under-running, where the current is collected from the lower surface of the rail, the rail being supported from the top, and the contact being pressed upwards by means of springs against the conductor rail. This system is not at present in use in this country, although installed to a very considerable extent in the United States and on the Continent.

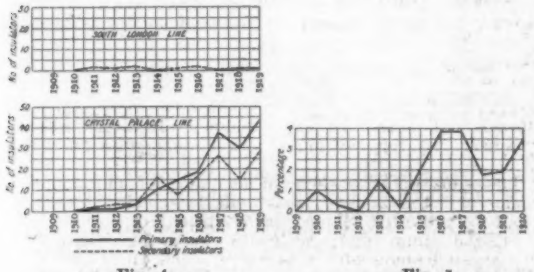


Fig. 4. Fig. 5.

Fig. 4.—Insulators Renewed on Account of Stone-throwing, Electric, Mechanical, and Steam Causes.

Fig. 5.—Percentage Renewal of Trolley Wire per Annum.

Side-running, such as was designed and installed by Sir John Aspinall on the Manchester-Bury section of the Lancashire & Yorkshire Railway, where the current is collected from the side of the conductor rail by means of a collector pressed laterally against the conductor rail by means of springs.

Conductor rails have to be interrupted at crossings and at complicated portions of the track, and in order to enable trains to leave and again make contact with the conductor rail at high speed either vertical or lateral ramps have to be installed to bring the collector shoe into gradual touch with the conductor rail.

Jumper cables have to be provided in order to connect electrically the different sections of the conductor-rail system, and experience has shown that where possible these should be laid either above ground or on the surface, so as to be easily accessible from the point of view of repairs and maintenance. Provision has also to be made by means of section switches to sectionalise the conductor rail so as to be able to isolate portions of it when required, in order to renew or repair portions of the track or in case of derailment.

The shape of the conductor varies very much, and no standard exists for this at present, neither has any standard yet been definitely adopted by all railways for the height or actual position of the conductor rail.

The rails must be of a special chemical composition so as to give the highest conductivity consistent with durability.

Referring to the question of gaps, with pressures up to 1,300 volts, no very great troubles with over-pressures have so far been encountered owing to contact shoes making and breaking contact, and it is quite possible to coast over lengthy gaps where multiple-unit trains are used. This becomes difficult, if not impossible, where electric locomotives are used to haul heavy loads, and where a gap would mean a complete interruption of energy to the train. In order to overcome this difficulty both on the New York Central and Hudson River Railroad and on the Pennsylvania Railroad, on complicated sections where the conductor rail has had to be interrupted an overhead construction to carry an overhead conductor rail has had to be installed.

With conductor rails operating at 600 volts, experience has shown that under normal conditions no protection is required or advisable, and, in fact, there are many cases where such protection having been originally installed has now been removed, not merely to reduce the cost of maintenance, but because it has been found that a conductor rail without such protection formed a smaller obstruction to the operating staff than a protected one. Notwithstanding the great mileage so far installed, the number of fatal accidents due to persons coming into contact with the conductor rail is very small, and such accidents have more generally occurred in the case of trespassers than of employés.

Where, however, a pressure of 1,200 or 1,500 volts is in use, the conductor rail must be protected, and a very suitable form of protection for a side contact has been adopted by the Lancashire & Yorkshire Railway on their Manchester-Bury section.

The most suitable material for this protection in this country has been found to be Jarrah wood.

Whilst on certain railways in certain cases it has been found necessary to anchor the conductor rail, experience on other lines seems to show that this is not always either necessary or desirable.

Insulators at present in general use are made of porcelain, earthenware, "Siluminite," reconstructed granite, and various other substances, and the normal spacing is in the neighbourhood of 9 or 10 ft. apart.

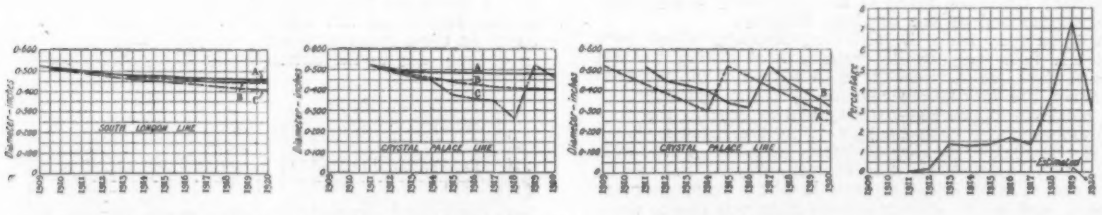
The only serious delays which have so far been caused in this country in connection with the conductor-rail system are in the case of those railways where top contact is made when abnormal weather conditions have caused the rail to be covered with a layer of ice. So far this difficulty appears to have been overcome either by under-running or by side-running.

As regards the question of wear and tear, it is very difficult owing to the varying conditions of climate, operation, and location, to come to any definite conclusion, but experience in the open air on the Metropolitan District Railway would seem to indicate that the loss of rail due to wear and tear and corrosion may be taken at something like 1 lb. per yard per annum, half of which is due to wear, and the other half to corrosion.

So far as the systems of conductor rail adopted in this country are concerned, it may be said that there are two definite principles at present in operation, and a third has been proposed. In the case of the Metropolitan and the Metropolitan District Railways, owing to the fear of the drop in the return circuit being limited to such a figure by the Board of Trade as to make it difficult to realise with an ordinary track rail return, these railways have adopted double conductor rails, one positive and the other negative, the track rails not being utilised as a part of the return circuit. This arrangement has brought about certain defects in connection with insulation of the apparatus on the trains, particularly when the negative conductor rail becomes earthed from any reason, due to over-pressures. The necessity of using two insulated conductor rails obviously increases both the capital and maintenance costs of the conductor system.

The other system is that adopted by the North-Eastern, the Lancashire & Yorkshire, and the London & South-Western Railways, and is one where only one insulated conductor rail is employed, the track rails being utilised for the return circuit either with or without a supplementary bonded rail or return conductor. This additional rail is bonded to the track rails, and serves merely for carrying current, and is not insulated from earth.

With a view to getting the benefit of 3,000 volts pressure, but at the same time not having to utilise any motors wound for a higher pressure than 1,500 volts, and in order to do away with any large currents returning through the track



A, no current; B, running current; C, starting current.

A, no current; B, local running current; C, local starting current.

A, heavy running current; B, starting current.

Fig. 6. Fig. 7

Fig. 6.—Relative Wear on Trolley Wire.

Fig. 7.—Percentage Renewal of Catenary Wire per Annum.

rails, Mr. Raworth, the electrical engineer of the South-Eastern & Chatham Railway, has proposed the adoption of a conductor-rail system requiring two insulated conductor rails per track, the track rails serving as a neutral. A similar system has been running for some years on the Nord-Sud line in Paris, which operates with an overhead conductor and insulated conductor rail, the difference of potential between these being 1,200 volts, and the track rails serving as neutral of a three-wire system.

The permissible voltage drop in the earthed return is the most important factor in the case of direct and alternating-current systems of traction.

At the present time there have been very considerable departures from the original standard as dictated by the Board of Trade for maximum voltage drop in rails of electric tramways where direct-current systems are concerned. The maximum allowance of 7 volts imposed on tramways has compelled such railways as have electrified under parliamentary powers, and who feared similar regulations being imposed upon them, to install insulated return-current conductor rails.

Other railways not so situated are operated with rail drops perhaps exceeding for short periods 20 times that figure. Either, therefore, the Board of Trade limit, as imposed on tramways, is unduly severe if applied to railways, or there is an amount of damage going on by way of electrolysis which must sooner or later involve considerable trouble.

Since sub-station distance, and, therefore, the economic operation of direct and alternating-current systems, are directly affected by rail drop, a time seems to have arrived when some decision should be taken on this point. The anomaly of one railway being afraid of being limited to a 7-volt drop while another is unrestricted should be removed.

At one time it was considered that A.C. had no harmful effect as far as electrolysis was concerned, and in any case this effect is very ysmvall compared with D.C.

The Board of Trade has recognised that a higher pressure drop can be admitted with alternating than with direct current. The first regulation laid down was 200 volt-minutes for a period not exceeding 10 minutes, which means that for short periods the drop may be twice as much. The question of cost is very largely governed by the number of sub-stations, and this in its turn is governed by the maximum drop allowed in the tract return.

The limitations of rail drop are, therefore, governed by considerations of economy and of inductive effects. The latter have not proved by any means so troublesome as had been prophesied, the effects of rail impedance being largely counterbalanced by the comparatively small current transmitted in the A.C. system.

It is not the intention of this paper to make any comparison between the merits of conductor rails and the overhead system, but merely to give information. It is, however, obvious that the presence of a charged rail near the track must increase the cost of maintaining the permanent way.

JOINT ELECTRICITY AUTHORITIES.

West of England (Group E. 8).

A meeting of authorised undertakers, representatives of County Councils, &c., concerned in the scheme for the supply of electricity, was held at Bristol on July 6th.

The Lord Mayor of Bristol (Mr. J. T. Francombe) welcomed the representatives, and expressed the hope that their deliberations might be crowned with success.

Mr. H. Faraday Proctor (Bristol Corporation Electricity Department), prior to taking the chair, moved a hearty vote of thanks to the Lord Mayor. He stated that they were met to consider the submission of a draft scheme to the Electricity Commissioners for the establishment of a joint electricity authority in the West of England, as stipulated in the Electricity (Supply) Act, 1919. The Organising Committee which was appointed at a general meeting of various authorised undertakers held on January 2nd, 1920, had put forward this draft scheme, which was not a scheme for affecting or securing any financial advantages from any particular alteration in the area. Section 5 of the Act required a scheme for the improvement of the existing organisation for the supply of electricity, but from certain letters he had received it appeared that there was some misapprehension on this point. Some appeared to have expected an engineering scheme which dealt with what generating stations it was proposed to construct or abolish. That was altogether outside the scheme. The authority had to be appointed; when this was done they could get to work and formulate their scheme. Regarding Herefordshire, this area was included at the request of the Commissioners, and not by the decision of the Organising Committee. The financial clauses of the proposed scheme were modelled on those proposed for the new Act. It was absolutely essential to have power to raise money, and to have facilities to raise it as cheaply as possible. The scheme dealt with the levying of a deficiency rate. The chief reason for putting that into the scheme was not because the Organising Committee considered that the undertaking would not be self-supporting, but to provide a better security for the lenders of money. The scheme was not binding; it would have to go before the Commissioners, who might make amendments, and it would come back to them for further consideration. To facilitate discussion, he suggested the consideration of the scheme in sections, and moved that pages 1 to 15, together with Schedule 2 be approved and adopted.

Colonel Russell Kerr (Glos. County Council) stated that his Council was favourably disposed towards the scheme, and was inclined not only to come in, but to come in with financial responsibility if it could be assured on one or two minor points.

Mr. F. Lynden Cooper (Monmouth County Council) inquired whether County Councils forming parties to the scheme would have equal liabilities.

Sir Harry Hatt (Chairman, Bath Electrical Committee) said he differed from the premises arrived at by the chairman. He considered the first duty of the Organising Committee was to devise a scheme which was going to comply with Section 5 of the Act, viz., which would conduce to greater efficiency and economy in the generation and distribution of electricity. The committee had misunderstood the reference made to it when it was appointed. As it was, they had a scheme before them for providing the money necessary to run a scheme which was not before them. The sole object of placing electrical engineers on the Organising Committee was that they might have some information as to the practicability of the scheme. The scheme which was before them might have been very well done by the town clerk of Bristol without the assistance of the electrical engineer. He suggested that the proper course for the conference to pursue was to adjourn the meeting, instruct the Organising Committee to prepare an engineering scheme, and ask the Commissioners to postpone the inquiry, and to that end he moved the following amendment:—

"That in the opinion of this Conference a scheme should be formulated for the grouping of districts so as to conduce to the efficiency and economy of electricity, and that in the meantime the Commissioners be asked to postpone their inquiry so that the scheme may be presented. Also that the Commissioners be respectfully asked to extend the date for the making of objections or representations."

Alderman G. Stevens (Swindon) seconded the amendment.

The Town Clerk of Swindon said his Council had given very careful consideration to the proposals put forward in the draft scheme, and desired to contribute in every possible way to the carrying out of the policy laid down by Parliament in the Act of 1919, but that did not say that a public representative body with its responsibilities to its constituents should not examine very carefully, and in detail, any proposals that were made which committed them to financial liabilities. His Council would take strong exception to the powers sought for the levying a deficiency rate in the event of the scheme not being self-supporting. He drew attention to Clause 19 which was practically copied from Clause 14 of the Bill now before Parliament. That Bill was not being proceeded with, and he considered it a source of danger to pass the scheme with that clause in. Clauses 19 and 25 were quite *ultra vires*, and he supported the amendment, as he considered more information was desirable on some of the proposals put forward.

Mr. F. Wardle (Town Clerk, Bath) stated that he expected to receive some information at this Conference of a special nature to enable them to arrive at a conclusion as to whether the scheme was practicable. Boundaries of areas had been defined without any regard being given to the engineering possibilities of those areas. The Commissioners would expect both sides to be presented, and he considered they were riding for a fall in proceeding with the present scheme.

Mr. R. Owen Seacombe (Town Clerk, Cheltenham) stated that the area which was included in the scheme was not the area selected by the Organising Committee. It was selected by the Commissioners. The idea of the Act was to widen the area of electricity supply so as to do away with a large number of smaller undertakings all working on different lines, and to get one area under one control to develop electricity in a more efficient manner. If there were any amendments desired in the scheme before them, they should be proposed.

Mr. J. H. Edwards (representing a number of smaller undertakings in the proposed area) said it would be much the better plan if speakers gave their attention to items of the scheme. Until the joint electricity authority was formed nothing could be done. He strongly advocated the passing of the scheme, reserving any objections until the inquiry of the Commissioners.

Mr. A. J. Howard (Taunton Electricity Department) said that Taunton was undecided as to coming into the West-of-England scheme. A joint authority was in process of formation at Exeter, which was nearer Taunton than Bristol, although they were not keen on coming into either.

Mr. E. T. Gardom (Gloucester County Council) complimented Mr. Proctor on the production of the present scheme. It had been submitted to the Parliamentary draughtsman, who had approved it. The Commissioners could alter the scheme if they thought fit. Objections could be raised at the inquiry.

Mr. H. Faraday Proctor, in replying to the discussion, said that the responsibility incurred was in proportion to voting power obtained. Personally, he thought it would be absolute folly for such a small committee as had been set up, assisted by a very few engineers, to endeavour to give a report upon what should be done within the area during the next five, ten, or fifteen years. This was the only scheme. He ought to make it quite clear regarding Beachley and the Forest of Dean. No action had been taken by the Organising Committee directly. True, the Commissioners had asked him to take action on their behalf, but what had been done

had been done under Clause 18 of the Act (Interim Works). It was the Commissioners who had the matter in hand. The time was not opportune to consider the points raised by Sir Harry Hatt; but they had not been lost sight of. If Taunton thought it better not to be included, the Organising Committee would raise no objection to the line being drawn on the near side to Bristol. If Hereford, Worcester, and Swindon desired to remain outside, the Committee would not oppose them. The area as submitted was that of the Commissioners, and not of the Organising Committee.

On the amendment being put 2 voted for, 16 against, 19 not voting. The chairman's resolution resulted in 20 voting for and 5 against. The remaining portions of the scheme were carried by a substantial majority in each case.

Mr. F. W. B. Cripps (Gloucestershire County Council) urged the necessity of proceeding immediately with the transmission lines from Beachley to the Forest of Dean coalfields, and a resolution making representations to the Commissioners to that effect was carried unanimously.

A hearty vote of thanks was accorded Mr. H. Faraday Proctor for presiding.

Local Inquiries.

With reference to the published notices dated as under of the provisional determination by the Electricity Commissioners of the following electricity districts:—

West of England or Lower Severn, April 30th (Elec. Rev., May 14th, p. 624; 21st, p. 646; 28th, p. 679);
Mid-Lancashire, May 27th (Elec. Rev., June 11th, p. 767);
West Riding or Aire and Calder and South-East Lancashire, June 18th (Elec. Rev., June 25th, p. 815);

and of their intention to hold local inquiries into the existing organisations for the supply of electricity in those districts, the Electricity Commissioners desire it to be known that any person wishing to make any objection or representation with regard to the inclusion of any areas in, or the exclusion of any areas from, the districts so provisionally determined, should do so in writing, as prescribed in the said notices, and within the time specified therein. Any body or person desiring to submit to the Commissioners a scheme for effecting an improvement in the organisation of the supply of electricity in a district can obtain from the secretary, Electricity Commission, Gwydyr House, Whitehall, London, S.W.1, a memorandum on the preparation of such a scheme and information about the steps to be taken in connection with its submission.

TRADE AND INDUSTRY IN GREECE.

The Commercial Secretary to the British Legation at Athens, in a report on the commercial and industrial situation of Greece, mentions that, subsequent to the signing of the armistice, industry in Greece made very considerable progress. A very considerable number of new factories were in course of erection or were projected. Amongst these were cotton spinning factories, wool manufactories, soap factories, oil mills, flour mills, &c. The leading industries, however, are the tanneries and soap factories, of which there are more in Greece than of other industries, and the greater part of the raw materials necessary for the carrying on of these industries is imported from abroad. During the latter part of the war, and until some time after the signing of the armistice, many important factories in Greece were unable to carry on at their regular output, or were obliged to shut down altogether owing to the shortage of fuel. A certain number managed to keep going in an unsatisfactory manner by using a mixture of wood and lignite. Amongst other results of the shortage of coal may be mentioned the greatly reduced supply of electric power, which was cut down to an absolute minimum for lighting requirements, and current for industrial purposes was for some time only supplied by the Athens power station to such concerns as were absolutely necessary. Consequent upon this, a good many flour mills at the Piræus were obliged to suspend work. A further result of the coal shortage was the shortage of gas. There had been no gas available for domestic or industrial purposes since 1916, practically to date, with a consequent disappearance of coke from the market.

The war gave the Greeks an opportunity for making the closer acquaintance of the British in general and of British goods, and the prolonged presence of the British troops in her territory and of British ships in her ports and around her coasts, created a certain amount of unconscious propaganda, with the result that the Greek traders became exceptionally well-disposed towards Great Britain, and were prepared, on equal terms, to give her the preference in trade. The Exhibition of the Federation of British Industries held in the Zappeion at Athens from October 19th until November 23rd, 1919, gave British manufacturers the opportunity of bringing their products to the notice of the Greek buyers.

The state of the Greek markets at the close of the year could be regarded as exceptionally healthy. The country had become practically depleted of nearly all imported goods owing to the ordinary difficulties experienced in obtaining these during the war. The result of this was that prices advanced quite disproportionately, and practically any manufactured goods which could be delivered found a ready sale. Importers and merchants made large profits, and consequently most of these became possessed of capital.

The report states that after the signing of the armistice, the United States was first in the field of the Greek markets with her industrial products, as was perhaps to be expected, owing to the lesser degree in which her industries have suffered owing to the war, and in the early days after the armistice. In certain parts of Greece, Italy led the field in imports, and she made strenuous efforts to retain her hold. Later on, however, British goods, as the productive power of British factories recovered from their enforced cessation of work owing to the war, again obtained the lead in the Greek market.

It is stated that if we are to maintain our trade supremacy it will be necessary for British merchants to study carefully the requirements of the markets. Quality and finish must be maintained, and consideration must be given in manufacture to the particular requirements of the country, due to climatic conditions and custom. Further, in order to be successful, British traders must learn to accommodate their clients in the matter of quotations. It is not sufficient to quote goods at a certain price ex factory or even f.o.b. This conveys nothing to the Greek merchant. What he wants to know is what the goods will cost him, delivered at Piræus, Patras, or Salonica. Then he knows where he stands, and is free to make his calculations accordingly and go ahead with his business. Every effort should be made, therefore, by merchants to quote prices c.i.f. at a Greek port wherever possible.

"One of the reasons why German goods, amongst others were so much to the fore in this country prior to the war, was that the German manufacturer did the thinking for his customer. For example, before the war, practically the most important engineering firm in Greece represented almost entirely German firms. On their being approached with a view to taking up British agencies, they explained that they were perfectly willing to do so, but that in the past they had represented German firms simply owing to the additional facilities they received from them. For example, when obtaining quotations for iron material for a reinforced concrete mill building for which they had obtained a contract to erect, the German firms when quoting for the material would submit complete plans and specifications for such a building. The British manufacturer, unfortunately, will not do this. He delivers the iron rods or girders on rail outside his factory and there his interest in the transaction often finishes."

It may be said that the commercial and industrial potentialities of Greece are at present in the earliest stage of their development. Greece has never had an opportunity of developing Macedonia, and numerous schemes have been projected for the erection of mills, waterworks, and irrigation schemes, and the Greek Government is giving very serious attention to the development of the agricultural resources of these new provinces.

The current of public opinion in Greece at the present moment runs very much in favour of Great Britain, and it is a very opportune moment for British manufacturers to take advantage of this in order to open up trade relations with this country.

The system of credit in force previous to the war has of necessity been very much modified owing to the altered conditions obtaining. In the old days foreign firms were quite content to forward their goods to Greece on terms of 30, 60, or 90 days' credit, but the terms in force to-day are usually those of part cash with order, and balance payable, either against shipping documents in England, or through a bank on arrival of the goods in Greece; or, and this perhaps in the majority of cases, by confirmed letter of credit. The Germans are not yet in a position to give protracted credits, but certain American firms of general export agents have already circularised importers here broadcast, offering the old terms of 30, 60, or 90 days' credit.

The general commercial status of the Greek trader has vastly improved of late years. The Greek business man now realises that it is to his interest to build up a steady regular trade with the houses he represents, and by regularity and reliability in his dealings with foreign houses, to inspire confidence and thereby increase his trade.

Chambers of Commerce have been formed within the last two years in all the principal towns of Greece, under the immediate auspices of the Ministry of Finance.

The most efficient manner of representation for British firms is undoubtedly that of appointing a local agent, with exclusive rights of representation over the whole of Greece or a certain portion thereof. There are many reliable Greek and British firms, disposing of a fair capital, who are anxious to obtain British agencies. Since the war a good many British firms have opened up offices here for the purpose of representing British manufacturers. As these firms mostly dispose of competent native travellers and are in close touch with the requirements of the market, this would undoubtedly appear to be the most practical means of representation for British firms in this market.

If British firms wish to improve their business in these markets they should not lose sight of the necessity of sending

out their representatives or travellers regularly, and of supplying them with a fair range of their samples and ample advertising matter, if possible, in the vernacular.

Another important point, which can be once more reiterated, is the necessity for quoting prices in the metric system and using francs and kilos or metres when quoting, as the Greek merchant, with few exceptions, is befogged by quotations in £. s. d. and avoirdupois.

Those who are interested in developments in Greece should obtain this report wherein are given names and particulars of shipbuilding and other works, railways, &c., and a good deal of information respecting social conditions and trade statistics.

TRAMWAYS AND LIGHT RAILWAYS ASSOCIATION.

ON the 2nd inst., the twenty-third ordinary general meeting of the Association was held at Caxton Hall, Westminster, Mr. R. J. Howley, C.B.E., M.Inst.C.E., vice-chairman, in the chair, when the Council's report and the accounts for 1919 were adopted. New members of Council for the ensuing year were elected as follows:—

*W. G. Bowden Smith, A. L. Barber, Fred Coutts, E. H. Edwards, H. England, A. L. C. Fell, L. E. Harvey, H. Holliday, Councillor R. Mayne, W. B. Pickering, *W. Shearer, C. J. Spencer, H. L. White, *A. W. A. Chivers, *P. M. Raffdale, *J. C. Whiteley, *J. A. Forde, E. R. Soames, C. G. Tegetmeier. The names marked with an asterisk are those of members that have been newly elected in place of others who have retired by rotation. The chairman and vice-chairman have not yet been nominated.

Following the meeting the twelfth Annual Congress was held, at which the first paper presented was that by Mr. C. J. Spencer, O.B.E., entitled "Some Notes on Transportation in America." The author said that his recent visit to the United States was an unqualified success from the point of view of the exchange of experiences with the very friendly American tramwaymen. After touching upon the financial position of undertakings, flat fare *v.* zone system, operating costs, double-deck *v.* single-deck cars, English and American practice in rolling stock (the Americans had made considerable progress as compared with conditions in this country), "pay as you leave," one-man safety car, coupled cars and peak loads, schedules, labour conditions, and maintenance and labour-saving devices, Mr. Spencer concluded by saying: "Generally, I came back impressed with the idea that there is room for considerable improvements in our methods in this country.

"On the other hand, I did not see very many indications of fundamental changes in tramway evolution and operation. I believe much remains to be done to improve the electric tramcar. We are all concerned with the excellent development of the internal combustion engine type of street passenger-carrying vehicle, and we cannot be blind to the possibilities of the future. It must be remembered that we have very considerable advantages in possessing a steel rail and the consequently large carrying capacity unit, in addition to an almost unlimited supply of power per vehicle and the unrivalled qualities of an electric motor for traction work. Much can be done to meet the development of the motor 'bus, but we must get down to fundamental design and scrap the idea of fixing trolleys, motors, and controllers to horse cars. I found our colleagues in the States very much alive to the necessity of progress in design, but most of the technical details did not differ materially from our own.

"We have in this country generally been first in really new ideas. I am sure that in the tramway world we should endeavour to regain our lead, and I hope the time is not too remote when our American friends are coming here to see the latest in transport practice."

Mr. P. J. Pringle, M.I.E.E., followed with his paper on "One-man Cars, Rail Sections, Corrugations, Differential Wages, and Depreciation Allowances, from Australian Experience." After reference to the wide adoption and success of one-man cars in the U.S.A., the author briefly described his own system of one-man car operation, remarking that the adoption of these cars had led to a marked reduction in platform accidents, and a reduction of 40 per cent. in the cost of insurance against third-party claims. The system could be applied to existing rolling stock.

The paper dealt at length with the subject of rail sections and the coning of rail and wheel treads. It said:—

"An increase in the coning of rail treads by wear admittedly shortens the life of a rail; therefore, why not postpone this coning effect as much as possible by starting off with flat rail and wheel treads? I would suggest that the Rail Standardisation Committee should suspend their present proposals, and that careful tests on several systems be made, as follows: (1) The extent of side swaying of the cars on systems both with badly and lightly coned treads and wheels compared with wheels turned up with flat treads; (2) that current consumption tests should be taken in the tests above; (3) that if any undertaking is to-day running with an original flat-rail tread in conjunction with a flat-wheel tread, the resultant coning of the rails should be carefully investigated."

After alluding to "differential wages," which principle is accepted by many of the Australian trade unions, the paper passed on to depreciation. Mr. Pringle showed curves of his own design, and said that 5 per cent. depreciation on diminishing values has in the past been allowed on all power-station plant, this procedure being the same as that in force here. This percentage is also allowed to any factory or works working approximately 305 days per annum (Sundays and holidays excluded) on the basis of 48 hours per week. It is obviously inconsistent and unfair to only grant the same allowance to undertakings which run continuously all the year round. The Federal authorities have courteously considered this aspect, and now grant 10 per cent. depreciation on diminishing values for all power station plant and 5 per cent. for all tramcars. With the enormous increase in the replacement cost of assets which compose our tramway and electrical undertakings, it is obvious that the old depreciation allowances want entire revision. If the replacement cost is double the original, then a 5 per cent. allowance is really only equivalent to 2½ per cent.; otherwise it assumes that the life is now double what it used to be.

Both papers were briefly discussed, and the Congress terminated in time to allow members to change and reassemble for the annual dinner which was held the same evening at the Connaught Rooms, Kingsway.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Protection of Transmission Lines Against Lightning.

It is seldom that one comes across really reliable information regarding the protection, against lightning, of H.T. transmission lines.

Various types of arrester, whose makers claim immunity from lightning trouble by their adoption, are on the market, but many engineers out East are still looking for a satistory protective device.

As H.T. lines are now common to all parts of the world, I wonder if any reader has useful experience of arresters in a really bad district. I believe that opinions, openly expressed in these columns, would be greatly appreciated by many engineers. As a base, I would suggest a 6,600-volt, 3-phase, 50-cycle installation, with star-connected generators (unearthed neutral) feeding direct on to the line, and supplying, at a distance of ten miles over hilly country, 6,000 ft. above M.S.L., oil-cooled step-down transformers, delta-connected on the H.T. side, and star on L.T.—unearthed neutral.

India. **Capricorn.**
June 10th, 1920.

[Much valuable information on this subject has emanated from the engineers controlling transmission systems in the Transvaal, where the conditions are very severe, and we have summarised it from time to time in our pages. The *Proceedings* of the American Institute of Electrical Engineers also contain many papers on lightning arresters and their behaviour.—EDS. ELEC. REV.]

What is the Contractor Doing?

I note the remarks of Mr. J. B. Epstein in your current issue, and would like to know what possible chance the British manufacturer has "in the great race for the home trade which has still got to be won" under present circumstances. In a number of the large towns in this country at the present moment displays of appliances, and particularly electrical heating and cooking apparatus, of American manufacture, may be noticed. Secure in his home market, the American manufacturer is now "dumping" his goods into this country, utilising the premises of complacent contractors and others *on terms of sale or return*. While American goods are admitted practically free of tax into this country the poor British manufacturer is groaning under the E.P.D., income tax, lack of raw material and capital, such as to render it practically impossible for him to succeed in holding his own, let alone capturing the British home market.

British Manufacturer.
July 12th, 1920.

The Electro-Deposition of Iron.

Regarding the article which appeared in the ELECTRICAL REVIEW, and the letter to the Editors published on June 25th, with reference to the process and its origin, the electro-deposition of iron is not something new discovered during the Great War. We do not claim to have originated electro-deposition of iron, but in the second edition of "Canning's Handbook on Electro-plating, &c.," published in 1903, particulars of a recipe and general working instructions were

given. Since then improved solutions and processes have been from time to time put on the market, while the electro-deposition of iron, as a commercial process, has been in actual practice in factories in this country continually for at least 12 years.

For **W. Canning & Co., Ltd.,**

Birmingham. ARTHUR B. CANNING,
July 12th, 1920. *Director.*

The E.P.E.A.

Will Mr. Jones, the general secretary of the E.P.E.A., explain why members are not excluded when they have proved themselves to be blacklegs? I am referring to those E.P.E.A. members at the Scottish Central Electric Power Co., who have not been paid in full the £30 bonus award granted to the E.P.E.A., and who sooner than adopt the strike policy have decided to go without this said bonus, although at the time the bonus award was given, they were all joyfully expecting the payment of this award. A good deal can be said about the methods adopted by the manager of this company, due to a great extent to the action of the E.P.E.A. members. Is it fair that when bonuses are granted E.T.U. members must fight alone to obtain them, and, when obtained, that the E.P.E.A. members should receive the same afterwards? E.T.U. members in general believe in amalgamating with the E.P.E.A., but actions as above mentioned tend to make it impossible.

Celt.

July 11th, 1920.

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

16,834. "Electric switches or liquid starters." Siemens-Schuckertwerke. June 22nd. (Germany, August 30th, 1918.)
17,484. "Sparking plugs." H. S. Cooke. June 28th.
17,497. "Device for working or driving electric light machinery, &c." J. W. Atkinson. June 28th.
17,530. "Ignition-timers for internal-combustion engines." J. A. Holm. June 28th.
17,545. "Electric regenerative control." British Thomson-Houston Co. (General Electric Co.). June 28th.
17,556. "Electric vehicles with storage batteries." A Couaillet. June 28th. (France, August 19th, 1919.)
17,558. "Manufacture of electric heaters." Hungarian Elekthermax Co. June 28th. (Hungary, August 22nd, 1919.)
17,564. "Totally-enclosed electric machines." Siemens-Schuckertwerke. June 28th. (Germany, 7th, 1914.)
17,565. "Dynamo-electric machines." Siemens-Schuckertwerke. June 28th. (Germany, March 30th, 1916.)
17,580. "Magnetos." Remy Electric Co. June 28th. (United States, December 17th, 1919.)
17,581. "Diaphragms for submarine signal transmitters." Atlas-Werke Akt.-Ges. June 28th. (Germany, July 20th, 1918.)
17,583. "Electric fire and burglar alarms." F. W. Conway. June 28th.
17,589. "Electric heating bodies." S. Sokal (Luftfahrzeugbau Schutte-Lanz). June 28th.
17,590. "Electrically-heated cooking plates." S. Sokal (Luftfahrzeugbau Schütte-Lanz). June 28th.
17,591. "Thermally-controlled circuit-interrupters." Igranic Electric Co. (Cutler Hammer Manufacturing Co.). June 28th.
17,595. Manufacture of zinc cups for dry cells for pocket lamps, &c. E. L. Gaston. June 28th. (France, June 28th, 1919.
17,611. "Sparking plugs." Soc. H. Trentelivres et Cie. June 28th. (France, May 28th, 1914.)
17,691. "Means of ignition for internal-combustion engines, &c." J. Evans. June 29th.
17,707. "Electric lamp sockets." H. Kohn. June 29th. (France, January 9th, 1917.)
17,709. "Electric repeaters." Western Electric Co. June 29th. (United States, May 20th, 1919.)
17,714. "Spark-plugs." G. W. Noe. June 29th.
17,723. "Electrically separating dust from gases and vapours." W. North. June 29th. (Germany, August 27th, 1917.)
17,727. "Protective covers for electric ignition plugs." A. F. Evans and Royal National Lifeboat Institution. June 29th.
17,732. "Electrical connecting devices." C. J. Marsollier. June 29th. (France, February 8th, 1916.)
17,733. "Electrical connecting devices." C. J. Marsollier. June 29th
17,735. "Dynamo-electric machines." Siemens-Schuckertwerke. June 29th. (Austria, January 29th, 1916.)
17,744. "Apparatus for electrical treatment of gases." A Mond. (International Precipitation Co.). June 29th.
17,747. "Means for safeguarding electrical recording and measuring instruments against fraud." G. M. Daniels. June 29th.
17,760. "Process of electrolytically working concentrated ores or alloys containing copper and nickel." P. Goldberg. June 29th. (Germany, July 9th, 1918.)
17,769. "Electric switches." S. A. Bunn. June 29th.
17,775. "Electrical calculating machines." A. Greier. June 29th.
17,822. "Electric motor controlling switchgear." C. C. Garrard, M. Solomon, and W. Wilson. June 30th.
17,843. "Electric generators." J. M. and J. W. Torrance. June 30th.
17,849. "Automatically-operated electric switch mechanism for kinematograph apparatus. J. W. Cliffe and T. B. Rutter. June 30th.
17,857. "Electro-magnetic wave-receiving arrangements." Ges. für Drahtlose Telegraphie. June 30th. (Germany, May 6th, 1918.)
17,874. "Ignition magnetos." E. A. Layton-Smith. June 30th.
17,901. "Electrode for depositing molten metal." W. H. Boorne. June 30th.
17,946. "High-tension transformers." Siemens & Halske Akt.-Ges. June 30th. (Germany, June 30th, 1919.)
17,947. "Vacuum apparatus." Siemens-Schuckertwerke. June 30th. (Germany, August 13th, 1915.)
17,948. "Anodes for vacuum apparatus." Siemens-Schuckertwerke. June 30th. (Germany, October 29th, 1915.)
17,962. "Maximum and minimum cut-out switch for electric polyphase alternating current-circuits." V. Martinetto. June 30th. (Italy, October 15th, 1915.)
17,963. "Emission and reception of submarine waves." P. Langevin. June 30th. (France, September 17th, 1918.)
17,967. "Means for fixing conducting wires to insulators." C. Romagnoli. June 30th.
17,975 and 17,976. "Ignition systems for combustion engines." M. Polak. June 30th.
17,980. "Sparking plugs." F. L. Rapson. June 30th.
17,986. "Automatic maximum switches." J. V. Balsley and A. Thode. June 30th. (Denmark, December 15th, 1917.)
17,997. "Electric logs." L. C. Eddy. June 30th. (United States, December 4th, 1916.)
18,013. "Apparatus for electro-magnetically extinguishing arc produced on breaking of electric circuit." F. Krupp Akt.-Ges. July 2nd. (Germany, June 11th, 1919.)
18,018. "Electric switch operated by current of air." F. Krupp Akt.-Ges. July 2nd. (Germany, December 27th, 1918.)
18,019. "Arrangement for suppressing spark produced on breaking a circuit having self-induction." F. Krupp Akt.-Ges. July 2nd. (Germany, October 23rd, 1915.)
18,026. "Apparatus for adjustment of distant continuous current motor." F. Krupp Akt.-Ges. July 2nd. (Germany, March 16th, 1918.)
18,028. "Systems of connection for regulating strength of current in divisions of two-part divided-current circuit." F. Krupp Akt.-Ges. July 2nd. (Germany, January 2nd, 1917.)
18,057. "Sparking plug." A. Chambers. July 2nd.
18,070. "Electrical indicators." J. H. Collings, M. J. Railing, and C. W. Saunders. July 2nd.
18,073. "Electric conduit boxes." M. J. Railing and T. Taylor. July 2nd.
18,074. "Holders for electric incandescent lamps." L. B. Codd and C. Martin. July 2nd.
18,097. "Insulators." Ohio Brass Co. July 2nd. (United States, May 29th, 1916.)
18,119. "Electric light fittings." R. Cox. July 2nd.
18,139. "Electric wiring system." D. M. G. Robinot de la Pichardais. July 2nd. (France, February 5th, 1919.)
18,140. "Regulating means for electrical machines." Soc. Anon. des Etablissements L. Bleriot. July 2nd. (France, Febeuary 20th, 1919.)
18,153. "Amplifying devices." Siemens & Halske Akt.-Ges. July 2nd. (Germany, October 25th, 1916.)
18,154. "Electrodes for vacuum apparatus." Siemens-Schuckertwerke. July 2nd. Germany, December 7th, 1918.)
18,168. "Electric switches." H. Sachs. July 2nd. (Germany, March 13th, 1919.)
18,170. "Dynamo-electric machines." Lacknitzer Eisenwerk Ges. July 2nd. (Germany, December 2nd, 1919.)
18,193. "Arrangement for testing lines, &c., in telephone plants." Relay Automatic Telephone Co. (G. A. Betulander and N. G. Palmgren). July 2nd.
18,215. "Magneto-electric generators." Quick Action Ignition Co. July 2nd. (United States, February 17th, 1916.)
18,220. "Electro-capillary contrivances." A. Orling & Orling's Telegraph Instruments Syndicate. July 2nd.
18,233. "Apparatus for reception of electro-magnetic waves." A. E. J. Ball and I. H. Parsons. July 2nd.
18,235. "Continuous-current gyroscope motor." F. Krupp Akt.-Ges. July 2nd. (Germany, November 18th, 1915.)
18,240. "Apparatus for finely-graduated regulation of a current strength." F. Krupp Akt.-Ges. July 2nd. (Germany, August 27th, 1917.)
18,241. "Overload switches having a power-storing device." F. Krupp Akt.-Ges. July 2nd. (Germany, June 21st, 1917.)
18,261. "Arrangement for testing electrical gyroscopic firing apparatus." F. Krupp Akt.-Ges. July 2nd. (Germany, January 2nd, 1919.)
18,275. "Mine signalling visual indicator." R. S. Gardner. July 2nd.
18,307. "Detection and production of compressional waves." R. A. Fessenden. July 2nd. (United States, March 23rd, 1918.)
18,313. "Electric amplifiers." Siemens & Halske Akt.-Ges. July 2nd. Germany, July 7th, 1916.)
18,314. "System for controlling relays for wireless high-speed telegraphy." Siemens & Halske Akt.-Ges. July 2nd. (Germany, May 27th, 1919.)
18,316. "Electric arc-welding apparatus." Siemens-Schuckertwerke. July 2nd. (Germany, July 11th, 1919.)
18,322. "Thermionic vacuum tubes." E. R. Stoekle. July 2nd. (United States, June 13th, 1917.)

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1918.

20,640. "Metallic electrodes for use in electric arc welding operations." C. J. Holslag. December 11th, 1918. (144,333.)
20,980. "Electro-magnetic apparatus for recording signals." E. S. Carey. December 16th, 1918. (144,337.)

1919.

2,990. "Receiving or collecting devices or mechanism for sound waves or vibrations." D. N. Browning. February 7th, 1919. (144,345.)
4,218. "Electric switches." J. A. Crabtree. February 20th, 1919. (144,352.)
5,617. "Electrically operated engine starters for self-propelled vehicles and other purposes." F. J. Gill. March 6th, 1919. (144,369.)
5,624. "Means for controlling or regulating dynamo-electric machines." F. E. Wilson, W. A. Shepherd, and Powell & Hanmer. March 6th, 1919. (144,371.)
5,710. "Electric impulse motor." M. E. A. Baule. May 16th, 1917. (124,432.)
5,810. "Earth connection for dissipating electric charges." E. Isherwood. March 8th, 1919. (144,376.)
6,189. "Method of making electrical condensers." W. Dubilier. October 30th, 1918. (134,517.)
8,133. "Electrical fuses." A. C. Wynne. April 1st, 1919. (144,419.)
10,357. "Control of power, absorbed in an electric furnace." D. F. Campbell, W. S. Gifford, H. S. Waite, and G. E. Taylor. April 25th, 1919. (144,438.)
11,347. "Electrical water-heating apparatus." J. F. Barr. May 7th, 1919. (144,446.)
11,433. "Bearings for electricity motor meters." J. Harris. May 7th, 1919. (144,447.)
12,530. "Trolley wheel fittings for the trolley poles of electrically-propelled vehicles." C. W. Mallins and J. P. Barker. May 19th, 1919. (144,456.)
17,902. "Electric arc furnaces." British Thomson-Houston Co. and H. C. Hastings. July 17th, 1919. (144,503.)
18,903. "Combination sparking plug and inlet valve fittings for explosion engines." N. Herzmark. July 30th, 1919. (144,506.)
19,108. "Means for starting internal-combustion engines, adapted also to be used for generating electric current." W. S. Jeal. August 1st, 1919. (144,509.)
19,726. "High-tension distributors in magneto-electric ignition machines." Scintilla. September 28th, 1918. (133,283.)
22,098. "Distributors for internal-combustion engines." S. S. Chenhall. September 8th, 1919. (144,521.)
22,646. "Electrical indicators and the like." J. C. Wrighton and Edison Swan Electric Co. September 15th, 1919. (144,525.)
25,305. "Combined walking stick and quick-firing automatic pistol." H. J. P. Renard and B. Demarteau. October 15th, 1919. (144,540.)
28,843. "Method and apparatus for duplex cable signalling." L. Cohen. May 27th, 1919. (143,834.)